FINAL

CORRECTIVE ACTION PLAN–PART B
ADDENDUM #1
FORMER PUMPHOUSE #1
FACILITY IDENTIFICATION NUMBER #9-025085
FORMER BUILDING 8060
HUNTER ARMY AIRFIELD, GEORGIA

Prepared for
U.S. Army Corps of Engineers
Savannah District
Under Contract Numbers DACA21-95-D-0022 and DACA63-97-D-0041
Delivery Order Numbers 0061 and CV01

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September 2001

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LIST OF ACRONYMS

ACL	alternate concentration limit
ATL	alternate threshold level
BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
COPC	chemical of potential concern
DAACG	Departure/Arrival Air Control Group
DPW	Directorate of Public Works
GA EPD	Georgia Environmental Protection Division
gpm	gallons per minute
GUST	Georgia Underground Storage Tank
HAAF	Hunter Army Airfield
hp	horsepower
IWQS	In-Stream Water Quality Standard
NPDES	National Pollutant Discharge Elimination System
PAH	polynuclear aromatic hydrocarbon
STL	soil threshold level
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UST	underground storage tank
USTMP	Underground Storage Tank Management Program
VOC	volatile organic compound

I. CORRECTIVE ACTION PLAN CERTIFICATION – PART B

(Form and certification follow this page.)

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Georgia Department of Natural Resources
Environmental Protection Division
Land Protection Branch
Underground Storage Tank Management Program
4244 International Parkway, Suite 104
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CORRECTIVE ACTION PLAN
PART B

Facility Name: Former Pumphouse #1 Site

Street Address: Former Building 8060, Near Taxiway 3

City: Hunter Army Airfield **County:** Chatham

Facility ID #: 9-025085

Submitted by UST Owner/Operator:
Name: Thomas C. Fry/Environmental Branch
Company: US Army/HQ 3d Inf. Div (Mech)
Address: Directorate of Public Works, Bldg 1137
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I. PLAN CERTIFICATION

A. UST Owner/Operator

I hereby certify that the information contained in this plan and in all the attachments is true, accurate, and complete, and the plan satisfies all criteria and requirements of Rule 391-3-15-.09 of the Georgia Rules for Underground Storage Tank Management.

Name: Thomas C. Fry
Signature: Thomas C. Fry Date: 10/09/01

B. Professional Engineer or Professional Geologist

Name: Patricia Stoll
Signature: Patricia Stoll
Date: 9/21/01

GEORGIA REGISTERED 22851 PROFESSIONAL ENGINEER 9/21/01
Georgia Stamp or Seal

Check all boxes below that apply. Attach supporting documentation, i.e., narrative, figures, tables, maps, boring/well logs, etc., for all items checked. Supporting documentation should be three-hole punched and prepared in conformity with the guidance document "Underground Storage Tank (UST) Release: Corrective Action Plan – Part B (CAP-B) Content", GUST-7B.

II. SITE INVESTIGATION REPORT

A. Horizontal and Vertical Extent of Contamination:

- ☒ Soil (Section II.A.1)
- ☒ Groundwater (Section II.A.2)
- ☒ Free Product (Section II.A.3)
- ☒ Surface Water (Section II.A.4)

B. Local and Site Hydrogeology

- ☒ Documentation of Local Groundwater Conditions (Section II.B.1)
- ☒ Stratigraphic Boring Logs (Section II.B.2)
- ☒ Stratigraphic Cross Sections (Section II.B.3)
- ☒ Referenced or Documented Calculations of Relevant Aquifer Parameters (Section II.B.4)
- ☒ Direction of Groundwater Flow (Section II.B.5)
  - ☒ Table of Monitoring Well Data (Table 5)
  - ☒ Potentiometric Map (Figure 13)
  - ☒ Flow Net Superimposed on a Base Map (Figure 13)

III. REMEDIAL ACTION PLAN:

A. Corrective Action Completed or In-Progress:

- ☒ Recovery/Removal of Free-Product (Non-aqueous Phase Hydrocarbons)
- ☐ Remediation/Treatment of Contaminated Backfill Material & Native Soils
- ☐ Other (specify)_____

B. Objective of Corrective Action:

- ☒ Remove Free Product That Exceeds One-Eighth Inch
- ☐ Remediate Groundwater Contamination That Exceeds:
  - ☐ Maximum Contaminant Levels (MCLs)

  OR

  - ☐ In-Stream Water Quality Standards

B. Objective of Corrective Action (continued):

☐ Remediate Soil Contamination That Exceeds:

☐ Threshold Values Listed in Table A

OR

☐ Threshold Values Listed in Table B

OR

☐ Alternate Threshold Levels (ATLs)

☒ Provide Risk Based Corrective Action (Reference CAP B App. VI) (Section III.B.4)

☒ Remediate Soil and/or Groundwater Contamination That Exceeds Alternate Concentration Limits (ACLs) and Monitor Residual Contaminants

OR

☐ Monitor Soil and/or Groundwater Contamination That Exceeds Levels in Rule -.09 (3) But Is Less Than ACLs

OR

☐ No Further Action Required - Soil and/or Groundwater Contamination is Below Levels in Rule -.09 (3)

C. Design Operation of Corrective Action Systems

☒ Soil ☒ Groundwater ☒ Free Product ☐ Surface Water ☐ Not Applicable

D. Implementation (Section III.D)

Includes, as a minimum, the following:

- Milestone schedule for site remediation
- Inspection and preventive maintenance schedule for all specialized remediation equipment
- Monitoring/sampling and reporting plan for measuring interim progress and project completion
- Plan to decommission equipment/wells and close site

IV. PUBLIC NOTICE

☐ Certified Letters to Adjacent, and Potentially Affected Property Owners and Local Officials

☒ Legal Notice in Newspaper, as approved by EPD (Section III.E)

☐ Other EPD-approved Method (specify)_____

V. **CLAIM FOR REIMBURSEMENT:** (For GUST Trust Fund sites only)

- ☐ GUST Trust Fund Application (GUST-36), must be attached if applicable
- ☐ Cost Proposal
  - ☐ Non-Reimbursable Costs

    OR
  - ☐ Reimbursable Costs
    - ☐ Total Project Costs
      - ☐ Costs incurred to date, per GUST-92
      - ☐ Estimated costs to complete corrective action, per GUST-92
    - ☐ Invoices and Proofs-of-Payment for Costs Incurred to Date
- ☐ Proposed Schedule For Reimbursement
  - ☐ Lump Sum Payment Upon Completion Of Corrective Action

    OR
  - ☐ Interim Payments With Final Payment Upon Completion
- ☒ Not Applicable

II. SITE INVESTIGATION REPORT

The results of the Corrective Action Plan (CAP)–Part B investigation at the Former Pumphouse #1, Facility ID #9-025085, Former Building 8060, at Hunter Army Airfield (HAAF), Georgia, were presented in the CAP–Part B Report (SAIC 2000). This report documents the supplemental investigation activities conducted at the Former Fuel Pit 1A Departure/Arrival Air Control Group (DAACG) area of the Former Pumphouse #1 site as recommended and approved in the CAP–Part B Report.

The Former Pumphouse #1 site is located along the east–west taxiway of HAAF, as illustrated in Figure 1. The Former Pumphouse #1 site is located within an average or higher groundwater pollution susceptibility area, is more than 500 feet from a withdrawal point, and is fewer than 500 feet from a surface water body. As defined in Georgia Underground Storage Tank (GUST) Management Rule 391-5-15.09, the appropriate soil threshold levels (STLs) are presented in Table B, Column 1 of GUST Rules 391-5-15 because a surface water body is located fewer than 500 feet from the site.

According to the operational information provided by the Fort Stewart Directorate of Public Works (DPW), Former Pumphouse #1 was an aviation-gas fuel island used from about 1953 until the early 1970s that consisted of ten 25,000-gallon underground storage tanks (USTs) and a 50,000-gallon underground defueling tank. The pumphouse was inactive from the 1970s to 1995. Eight of the 25,000-gallon USTs were removed in 1995. The 8-inch cast iron piping internal to the Former Pumphouse #1 facility was removed prior to the tank removal exercise. The 50,000-gallon defueling tank and two of the 25,000-gallon tanks remained in place, partially under the pumphouse structure. In 1998 the pumphouse structure was removed along with the two remaining 25,000-gallon USTs, and the 50,000-gallon defueling tank was closed in place. The piping from the boundary of the pumphouse facility to the bulk fuel farm was also drained, pigged, and grouted in place.

Various closure activities as well as CAP–Part A and CAP–Part B investigations at the Former Pumphouse #1 site were performed between 1995 and 2000. The Former Pumphouse #1 investigations covered an area south of the active taxiway. CAP–Part A and CAP–Part B investigations were conducted at the DAACG facility in 1995 and 1996, respectively. These investigations covered the active tarmac north of the active taxiway. Review of the analytical data from all of the investigations indicated that it was necessary to combine the DAACG facility data and the Former Pumphouse #1 data to document the nature and extent of contamination. As a result, the Former Pumphouse #1 CAP–Part B Report (SAIC 2000) combined the results from all the investigations in a single report. It was submitted to the Georgia Environmental Protection Division (GA EPD) in August 2000 and approved by GA EPD in correspondence dated December 18, 2000 (Logan 2000).

As indicated in the Former Pumphouse #1 CAP–Part B Report, there are two distinct and separate plumes located within the vicinity of the Former Pumphouse #1 site. Release #1 is an area of soil and groundwater contamination near the DAACG facility in the vicinity of Former Fuel Pits 1A and 1B, approximately 900 feet west of former Building 8060 (i.e., Pumphouse #1). In February 2000, free product was identified in this area in six wells (i.e., D-MW1, D-MW2, D-MW8, D-MW11, D-MW13, and D-MW17) at thicknesses ranging from a sheen to 0.88 foot. Throughout this document Release #1 will be referred to as the Former Fuel Pit 1A/DAACG area. Release #2 is an area of soil and groundwater contamination located near the Former Pumphouse #1 facility and Former Fuel Pits 1C and 1D, approximately 200 feet north of the former tank pits. Throughout this document Release #2 will be referred to as the Former Pumphouse #1 tank pit area. Based on the proximity of the various former fuel pits to the areas of contamination, it appears that a release from Former Fuel Pit 1A is responsible for the contamination associated with Release #1 and that a release from Former Fuel Pit 1C is responsible for the contamination associated with Release #2. During the CAP–Part B investigation activities, the

horizontal and vertical extent of petroleum-related contamination in soil and groundwater was determined for both areas of contamination.

For the Former Fuel Pit 1A/DAACG area (Release #1), the CAP–Part B Report recommended additional investigation activities to further define the extent of the free product and to determine the amount of recoverable free product at the Former Fuel Pit 1A/DAACG area prior to proposing a remediation system for the site. As a result, eleven 4-inch wells were installed in February 2001 to delineate the free product area around the Former Fuel Pit 1A/DAACG area, 31 monitoring wells were sampled in March 2001, and field bailout tests were conducted in three wells to evaluate the thickness of the free-phase product. The locations of the monitoring wells installed as part of the CAP–Part B investigation and supplemental investigation activities are shown in Figure 2.

For the Former Pumphouse #1 tank pit area (Release #2), the CAP–Part B Report recommended semiannual monitoring of eight wells (i.e., D-MW5, D-MW6, P1-MW1, P1-MW2, P1-MW18, P1-MW19, P1-MW22, and P1-MW23) for benzene, toluene, ethylbenzene, and xylenes (BTEX). The CAP–Part B Report was approved by GA EPD in correspondence dated December 18, 2000 (Logan 2000). Semiannual monitoring is scheduled to begin in September 2001 and will continue at the site until the benzene concentrations in groundwater are below the alternate concentration limit (ACL) of 285 µg/L for two sampling events. Once the benzene ACL has been achieved at the Former Pumphouse #1 tank pit area, three confirmatory soil samples will be collected from the area of soil alternate threshold levels (ATLs) of 9.3 mg/kg and 2.1 mg/kg, respectively. The results of the monitoring program for the Former Pumphouse #1 tank pit area will be documented in future annual monitoring only reports. This release is not addressed in this addendum. However, the approved monitoring only program is being implemented in accordance with the GA EPD–approved CAP–Part B Report.

This addendum to the Former Pumphouse #1 CAP–Part B Report is being submitted to the GA EPD Underground Storage Tank Management Program (USTMP) to document the results of the supplemental investigation activities for the Former Fuel Pit 1A/DAACG area (Release #1) only. Science Applications International Corporation performed the supplemental investigation for the HAAF DPW Environmental Branch through the U.S. Army Corps of Engineers (USACE), Savannah District under contracts DACA21-95-D-0022, delivery order 0061 and DACA63-97-D-0041, delivery order CV01.

II.A. HORIZONTAL AND VERTICAL EXTENT OF CONTAMINATION

The horizontal and vertical extent of petroleum-related contamination in soil and groundwater was delineated by activities performed during the previous investigations at the Former Pumphouse #1 site and the DAACG facility, which were documented in the CAP–Part B Report (SAIC 2000). The supplemental investigation activities were performed in accordance with the technical approach described in the CAP–Part B Report and the requirements of the *Work Plan for Preliminary Groundwater and Corrective Action Plan–Part A Investigations at Former Underground Storage Tank Sites, Hunter Army Airfield, Georgia* (SAIC 1998) and the *Addendum #4 to Sampling and Analysis Plan for Preliminary Groundwater and Corrective Action Plan–Part A/Part B Investigations at Former Underground Storage Tank Sites, Hunter Army Airfield, Georgia* (SAIC 2001).

II.A.1. Delineation of Soil Contamination at the Former Fuel Pit 1A/DAACG Area (Release #1)

In the vicinity of the Former Fuel Pit 1A/DAACG area (Release #1), the horizontal extent of petroleum-related contamination was determined during the various investigations and was discussed in detail in the CAP–Part B Report (SAIC 2000). Concentrations of benzene, toluene, ethylbenzene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, chrysene, and indeno(*1,2,3-cd*)pyrene exceeded the applicable GUST STLs (i.e.,

Table B, Column 1), and concentrations of benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene exceeded their respective ATLs.

During the installation of monitoring wells (D-MW33 through D-MW43) in February 2001, soil samples were collected for geochemical analyses. Field screening through volatile organic compound (VOC) headspace was performed on all soil samples collected from above the saturated zone during the monitoring well installations. For each 2-foot-length soil sample collected, VOC headspace readings were measured using an organic vapor analyzer. The field screening results are presented on each boring log included in Appendix IV. One soil sample was collected from each boring using field screening methods and analyzed for BTEX, polynuclear aromatic hydrocarbons (PAHs), and lead. Analytical results are summarized in Table 1 and presented Figure 3. The results from soil samples collected during the CAP–Part B supplemental investigation activities in February 2001 are summarized below.

- Benzene was detected in three of the 11 soil samples collected at concentrations ranging from 0.00048J mg/kg to 1.44J mg/kg. In addition, six samples had elevated detection limits ranging from 0.131 mg/kg to 11.3 mg/kg. Two of the concentrations and the elevated detection limits exceeded the benzene STL of 0.017 mg/kg. The elevated detection limit in well D-MW35 exceeded the GA EPD–approved benzene ATL of 9.3 mg/kg

- Toluene was detected in seven of the 11 soil samples collected at concentrations ranging from 0.0949J mg/kg to 2,550 mg/kg. The concentration in well D-MW35 exceeded the toluene STL of 115 mg/kg and the GA EPD–approved ATL of 479 mg/kg.

- Ethylbenzene was detected in nine of the 11 soil samples collected at concentrations ranging from 0.136J mg/kg to 355 mg/kg. The concentration in well D-MW35 exceeded the ethylbenzene STL of 18 mg/kg and the GA EPD–approved ATL of 187 mg/kg.

- Xylenes were detected in ten of the 11 soil samples collected at concentrations ranging from 0.0015J mg/kg to 1,860 mg/kg. The concentration in well D-MW35 exceeded the xylenes STL of 700 mg/kg and the GA EPD–approved ATL of 893 mg/kg.

- Acenaphthalene, anthracene, benzo(*a*)anthracene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, or pyrene was detected in six of the 11 soil samples collected. The concentrations of benzo(*a*)anthracene and chrysene did not exceed the GUST STL of 0.66 mg/kg. None of the other constituents detected has a GUST STL.

II.A.2. Delineation of Groundwater Contamination at the Former Fuel Pit 1A/DAACG Area (Release #1)

BTEX and PAH compounds were detected in groundwater samples collected during the various investigations. This contamination was discussed in the CAP–Part B Report (SAIC 2000). Based on the results of fate and transport modeling, an ACL of 285 µg/L was proposed for benzene in groundwater and was approved by GA EPD in correspondence dated December 18, 2000 (Logan 2000). Benzene was the only constituent at the Former Fuel Pit 1A/DAACG area (Release #1) and the Former Pumphouse #1 tank pit area (Release #2) to exceed its In-Stream Water Quality Standard (IWQS) and ACL during the various investigations.

II.A.2.a. Horizontal extent of groundwater contamination

In the vicinity of the Former Fuel Pit 1A/DAACG area, the horizontal extent of this plume was defined during the CAP–Part B investigation. The groundwater is migrating toward the underground storm drain located to the northwest of the Former Fuel Pit 1A. The dissolved plume appears to migrate beyond the storm drain to the northwest. Several PAH compounds exceeded their respective IWQSs or risk-based screening criteria, but the concentrations did not exceed their respective ACLs. Benzene was the only contaminant to exceed its IWQS of 71.28 µg/L and ACL of 285 µg/L during the various investigations.

As a result of the recommendations presented in the CAP–Part B Report (SAIC 2000), 11 additional monitoring wells were installed in February 2001 to better delineate the extent of free product in the vicinity of the Former Fuel Pit 1A/DAACG area. In March 2001, groundwater samples were collected from selected wells within the Former Fuel Pit 1A/DAACG area and analyzed for BTEX. Thirty-one groundwater samples were collected for geochemical analysis, as presented in Table 2 and Figure 4. Monitoring well locations are shown in Figure 2.

Benzene was identified in 20 groundwater samples during the supplemental investigation. Benzene concentrations ranged from 0.2J µg/L to 765 µg/L, as illustrated in Figure 5. The concentrations in 12 samples exceed the Georgia IWQS of 71.28 µg/L. The concentrations in four samples were above the site ACL for benzene of 285 µg/L. With the exception of one sample, the analytical detection limit for benzene was 1 µg/L.

Toluene was identified in 24 groundwater samples during the supplemental investigation. Toluene concentrations ranged from 0.27J µg/L to 29,600 µg/L, as illustrated in Figure 6. The concentrations did not exceed the Georgia IWQS of 200,000 µg/L or the site ACL for toluene of 800,000 µg/L. With the exception of one sample, the analytical detection limit for toluene was 1 µg/L.

Ethylbenzene was identified in 25 groundwater samples during the supplemental investigation. Ethylbenzene concentrations ranged 0.20J µg/L to 1,280 µg/L, as illustrated in Figure 7. The concentrations did not exceed the Georgia IWQS of 28,718 µg/L or the site ACL for ethylbenzene of 114,800 µg/L .The analytical detection limit for ethylbenzene was 1 µg/L.

Total xylenes were identified in 28 groundwater samples during the supplemental investigation. Total xylenes concentrations ranged from 0.43J µg/L to 6,370 µg/L, as illustrated in Figure 8. There is no Georgia IWQS for xylenes, and the concentrations did not exceed the federal maximum contaminant level of 10,000 µg/L. An ACL was not calculated for xylenes as part of the CAP–Part B Report. The analytical detection limit for total xylenes was 3 µg/L.

II.A.2.b. Vertical extent of groundwater contamination

The vertical extent of groundwater contamination at the Former Fuel Pit 1A/DAACG area (Release #1) was delineated through soil sampling during the CAP–Part B investigation and was discussed in the CAP–Part B Report (SAIC 2000).

II.A.3. Delineation of Free Product Plume at the Former Fuel Pit 1A/DAACG Area (Release #1)

II.A.3.a CAP–Part B investigation, 2000

Free product was identified at the Former Fuel Pit 1A/DAACG area in February 2000. The free product was observed in wells D-MW1, D-MW2, D-MW8, D-MW11, D-MW13, and D-MW17 at thicknesses ranging from a sheen to 0.88 foot.

Following the CAP–Part B investigation, the interim corrective action consisted of free product recovery in the wells via absorbent socks, which were installed on February 22, 2000. The absorbent socks were removed and replaced on a bimonthly basis from May 2000 through July 2001, as indicated in Table 3. Absorbent sock removal and replacement was discontinued in several perimeter wells between December 2000 and May 2001 due to a lack of free product in these wells. During this time period, water/product level measurements were performed on a bimonthly basis.

II.A.3.b Supplemental investigation, 2001

As recommended in the CAP–Part B Report, eleven 4-inch monitoring wells (D-MW33 through D-MW43) were installed in February 2001 to supplement CAP–Part B investigation activities at this site. Water level measurements were collected from the wells in and around the product plume on March 7, 2001 (Table 3). The measured thicknesses of free product were 1.26 feet, 1.47 feet, 1.62 feet, and 0.04 foot in wells D-MW2, D-MW34, D-MW35, and D-MW38, respectively. Due to the free product recovery via absorbent socks, free product was not observed in perimeter wells D-MW1, D-MW8, D-MW11, D-MW13, and D-MW17. However, the absorbent socks were removed from the perimeter wells in December 2000 and were not reinstalled. As indicated in Table 3, the free product reappeared in the perimeter wells in May 2001, and absorbent socks were placed in the wells.

II.A.3.c. Field bailout tests

On March 10, 2001, field bailout tests were conducted in wells D-MW2 and D-MW34 using the field bailout test method (Gruszczenski 1987). The apparent product thicknesses (i.e., the thicknesses measured in the wells) were 1.35 feet in D-MW2 and 1.50 feet in D-MW34. Once the static product level and static water level were measured, the free product was pumped from each well with a peristaltic pump. As the free product recovered in the well, the product and water levels were measured. The methodology and analytical results of the bailout tests are presented in Attachment A. The results indicate that the actual formation product thicknesses were approximately 0.15 foot and 0.09 foot in wells D-MW2 and D-MW34, respectively, in March 2001. The bimonthly absorbent sock activity had been effective in removing the free product along the outer boundary of the free product plume, resulting in a smaller product area in March 2001. After several months (i.e., December 2000 through May 2001) without absorbent socks in the perimeter wells, however, the free product began to accumulate in the perimeter wells again in May 2001; therefore, the May 2001 product plume was used to calculate the product volume instead of the March 2001 product plume. In May 2001, the area of the product plume covered approximately 120,750 ft^2; however, the thickest portion of the plume covered an area of approximately 49,000 ft^2 (Figure 9). Based on the actual formation product thicknesses calculations and the area of the product plume in May 2001, there are approximately 13,000 gallons of free product floating on the groundwater table southwest of the flight line barricades and approximately 3,000 gallons of this product are estimated to be recoverable.

To confirm the results of the field bailout tests conducted in March 2001, field bailout tests were conducted in wells D-MW2, D-MW34, and D-MW35 on July 26, 2001. The measured thicknesses of free product were 1.31 feet, 1.49 feet, and 1.89 feet in wells D-MW2, D-MW34, and D-MW35, respectively

(Table 3). The area of free product in July 2001 was 147,500 ft^2; however, the thickest portion of the plume covered an area of approximately 61,200 ft^2 (Figure 10). The results indicate that the actual product thicknesses were approximately 0.15 foot, 0.32 foot, and 0.21 foot in wells D-MW2, D-MW34, and D-MW35, respectively. Based on the actual product thickness calculations (Attachment A), there are approximately 21,000 gallons of free product floating on the groundwater table southwest of the flight line barricades and approximately 5,000 gallons of this product are estimated to be recoverable.

From an aerial extent, the majority of the free product plume is located north and east of the flight line barricades, underneath an active tarmac that is associated with active military flight operations, as shown in Figures 9 and 10. The actual formation thickness north and east of the flight line barricades typically ranges from 0.01 feet to 0.04 feet. The amount of recoverable free product under the active tarmac area is very limited. However, the thickest and most recoverable portion of the free product plume is located in the vicinity of wells D-MW2, D-MW34, and D-MW35, which are located southwest of the flight line barricades.

II.A.4. Delineation of Surface Water and Sediment Contamination

Results from the surface water and sediment samples collected during the CAP–Part B investigation were discussed in the CAP–Part B Report (SAIC 2000).

II.B. REGIONAL, LOCAL, AND SITE HYDROGEOLOGY

A discussion of the regional, local, and site hydrogeology was presented in the CAP–Part B Report (SAIC 2000) and is repeated in this document for convenience.

II.B.1. Documentation of Local Groundwater Conditions

II.B.1.a. Groundwater usage

According to the *Groundwater Pollution Susceptibility Map of Georgia* (GA EPD 1992), the Former Pumphouse #1 site, Facility ID #9-025085 is located within an average or higher groundwater pollution susceptibility area. Nine water supply wells are located within the confines of the HAAF area (Figures 11 and 12). These wells have the potential to provide up to 3,890 gallons per minute (gpm) of water to occupants of the HAAF installation. Fort Stewart DPW was unable to provide documentation listing the companies responsible for well installation and drillers' logs showing as-built information and subsurface geologic data. Information concerning such documentation was requested from several water well drilling companies in the Chatham County area; however, data procurement met with very limited success. Fort Stewart DPW provided well locations, pump rates, treatments, casing depths, and total depths for eight of the nine wells located at HAAF. Because of the lack of data, documentation of subsurface geology based on HAAF drilling logs remains extremely limited; therefore, other references containing deep-well information were used to document the subsurface geology and aquifer characteristics underlying HAAF and its vicinity.

Wells 1 and 2, both public water supply wells located in the cantonment area of HAAF, constitute the main water supply system at HAAF (Figure 12). Well 1, located at Building 711 on the corner of Moore Road and Douglas Street, is a 12-inch-diameter well with a 100-horsepower (hp) turbine pump serving a 100,000-gallon elevated storage tank (Tank 1) through 10-inch lines. Water from Well 1 is injected with hydrofluosilic acid and chlorine gas solution at the well house. Well 2, located at Building 1205 on the corner of Neal Street and Lightning Drive, is a 12-inch-diameter well with a 100-hp turbine pump serving a 200,000-gallon elevated tank (Tank 2) through 10-inch lines. Water from Well 2 is also injected with

hydrofluosilic acid and chlorine gas solution at the well house. Wells 1 and 2 provide water to a 500,000-gallon elevated storage tank (Tank 3) located on Middleground Road behind noncommissioned officer family housing. This tank provides potable water to 694 service connections, which are used by an average of at least 5,000 individuals year-round.

Wells 3, 4A, and 7 are public supply wells located outside the cantonment area of HAAF. Well 3, located at Building 8455, is a 4.0-inch-diameter well with a 1.0-hp electric submersible pump serving a 1,000-gallon hydropneumatic storage tank through 1.5-inch galvanized steel lines. Water from Well 3 is treated with calcium hypochlorite solution and is consumed by approximately 25 people during daytime hours year-round. Well 4A, located at Building 8581 at the 117th Air National Guard Facility, is a 4.0-inch-diameter well. Pumping is accomplished by a 0.75-hp turbine pump with an 80-gpm capacity. Well 4A provides water for approximately 50 people per day year-round. Well 7 is located at Building 8703 on the Forest River, west of Rio Road. Well 7 is a 4.0-inch-diameter well with a 3.0-hp submersible pump serving a 5,000-gallon hydropneumatic tank through 2.0-inch galvanized steel lines. Well 7 serves approximately 500 people on a part-time basis. Sanitary protection for Wells 3, 4A, and 7 is provided by a pump motor block, concrete slab, sealed well head, and screened casing vent.

Based on the GA EPD criteria of serving potable water to fewer than 25 occupants per day and having fewer than 15 service connections, Wells 5, 8, and 9 are classified as non-public supply wells.

Well 10 is a non-potable water source, and the water is used for cleaning military equipment at a wash-rack facility. Additional information, including capacity, borehole depth, and casing depth, is not available. The locations of supply wells found outside the boundary of HAAF are shown on Figure 17. These wells include numbers 1, 42, 13, 25, 15, 27, 14, 23, 6, and 9. The City of Savannah Bureau of Water Operations was unable to provide drilling logs or as-built well information related to these wells.

The Former Pumphouse #1 site is approximately 4,200 feet southwest (downgradient) of HAAF Well 2, which is located at Building 1205 on Lightning Road. Well 3, which is located at Building 8455, is approximately 6,700 feet southwest (downgradient) of the Former Pumphouse #1 site. Therefore, the Former Pumphouse #1 site, including both Release #1 and Release #2, is classified as being more than 500 feet from a withdrawal point. Well 2 is part of the main public water supply system at HAAF. This system supplies water to approximately 7,500 people through 525 service connections.

II.B.1.b. Aquifer description

The hydrogeology in the vicinity of HAAF is mostly influenced by two aquifer systems. These are referred to as the Principal Artesian (Floridan) Aquifer and the surficial aquifer (Miller 1990). The Principal Artesian Aquifer is the lowermost hydrologic unit and is regionally extensive from South Carolina to Georgia, Alabama, and most of Florida. Known elsewhere as the Floridan, this aquifer, approximately 800 feet in total thickness, is composed primarily of Tertiary-age limestone, including the Bug Island Formation, the Ocala Group, and the Suwannee Limestone. Groundwater from the Floridan is used primarily for drinking water (Arora 1984). According to Miller (1990), one of the largest cones of depression produced in the Floridan Aquifer exists directly beneath Savannah, Georgia. According to 1980 estimates, more than 500 million gallons of water per day were withdrawn from the Floridan Aquifer for public and industrial use in southeast Georgia, more than any other region (Miller 1990).

The confining layer for the Floridan Aquifer is the phosphatic clay of the Hawthorn Group. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990). The surficial aquifer overlies the Hawthorn confining unit.

The surficial aquifer consists of widely varying amounts of sand and clay, ranging from 55 feet to 150 feet in thickness, and is composed primarily of the Satilla and Cypresshead Formations in the Savannah vicinity (Arora 1984). This aquifer is primarily used for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 feet to 10 feet below ground surface (BGS) (Miller 1990). Groundwater in the surficial aquifer system is under unconfined, or water table, conditions. Locally, however, thin clay beds create confined or semiconfined conditions.

Groundwater encountered at HAAF UST investigation sites is part of the surficial aquifer system. Based on the facts that all public and non-public water supply wells draw water from the Floridan Aquifer and that the Hawthorn confining unit separates the Floridan Aquifer from the surficial aquifer, it is concluded that there is no hydraulic interconnection between HAAF UST sites (and associated plumes) and water supply withdrawal points.

II.B.1.c. Surface water

The water resources survey conducted during the CAP–Part B site investigation is presented in Appendix III. Surface water bodies at HAAF include Hallstrom Lake, Lamar Canal, Buckhalter Canal, Springfield Canal, Pond 29 located northwest of Buildings 336 and 232, and an unnamed pond located along the southeastern boundary of the HAAF installation (Figure 11). Several unnamed drainage canals and ditches exist throughout HAAF. Most of these canals drain southwest into the Little Ogeechee River, which is part of the Lower Ogeechee watershed. The remaining drainage canals located on the eastern side of the HAAF installation flow east and eventually drain into the Vernon River, which is located southeast of the HAAF installation. Surface water bodies at HAAF and adjacent areas are not used as public water supplies. The ponds and lakes, as well as Lamar Canal, are perennial, whereas most of the drainage canals and ditches are intermittent. Most of the drainage canals are at least partially enclosed in culverts.

There is a groundwater divide at the Former Fuel Pit 1A/DAACG area with groundwater flowing to the south-southwest and to the northwest. To the southwest there is an underground storm drain located 510 feet south-southwest of D-MW2, which is connected to a drainage ditch located south of the former tank pit area. To the northwest there is an underground storm drain located 450 feet northwest of D-MW2 and a drainage ditch located 1,000 feet northwest of D-MW2. At the Former Pumphouse #1 tank pit area, a drainage ditch is located approximately 300 feet south of the former tank pits and may receive some of the groundwater from the site. Based on the surface water features discussed in Appendix III, the Former Pumphouse #1 site, Facility ID #9-025085 is classified as being located fewer than 500 feet from a surface water body.

There are numerous underground water, electrical, and abandoned fuel lines that connect the former fuel pits located at the edge of the taxiway north of the former tank pits. These underground lines are located upgradient of the area of contamination around the former tank pits and are within the area of contamination near the Former Fuel Pit 1A/DAACG area. The invert depth of the former fuel transfer line in the vicinity of Fuel Pit 1A is approximately 6.4 feet BGS. There are two monitoring wells that are located in the vicinity of Fuel Pit 1A, and in March 2001 the depths to groundwater in these wells were 10.49 feet in P1-MW11and 10.98 feet in P1-MW13. Therefore, the invert depth of the former fuel transfer line is located approximately 4.0 feet above the water table. During the CAP–Part B investigation in 1999, the invert depth was approximately 2.0 feet above the water table. The water and electrical lines run adjacent to the former fuel transfer line. It is estimated that the invert depths of these utilities are no more than 5 feet BGS.

II.B.2. Stratigraphic Boring Logs

The local stratigraphy of HAAF and its vicinity is presented in Section II.B.2.a, and the site stratigraphy from the CAP–Part A and CAP–Part B site investigations is presented in Section II.B.2.b.

II.B.2.a. Local stratigraphy

HAAF is located within the barrier island sequence district of the coastal plain physiographic province of the southeastern United States (Clark and Zisa 1976). The barrier island sequence district in Chatham and Bryan counties is characterized by the existence of several marine terraces (step-like topographic surfaces that decrease in elevation toward the coast). These marine terraces, and their associated deposits, are the result of sea level fluctuations that occurred during the Pleistocene epoch. The surficial (Quaternary) deposits in Chatham and Bryan counties, by decreasing elevation and age, are part of the Okefenokee, Wicomico, Penholoway, Pamlico, and Silver Bluff terrace complexes.

HAAF, as well as most of Chatham County, is underlain by the Pleistocene Pamlico Terrace. The Pleistocene Satilla Formation (formerly known as the Pamlico Formation) consists of deposits of the Pamlico Terrace complex and other terrace complexes in the region. The Satilla Formation is a lithologically heterogeneous unit that consists of variably bedded to non-bedded sand and variably bedded silty to sandy clay. During the Pleistocene, these sand and clay deposits were formed in offshore and inner continental shelf, barrier island, and marsh/lagoonal-type environments. According to the *Geologic Map of Georgia* (GA DNR 1976), clay beds of marsh origin, which were deposited on the northwestern side of the former Pamlico barrier island complex, exist in the western quarter of HAAF. Very fine- to coarse-grained sand deposits of barrier island origin are more common throughout the remaining areas of HAAF.

II.B.2.b. Site stratigraphy

As determined from soil borings drilled during the CAP–Part B site investigation, the lithologies present within 15 feet of the surface at the site appear to correlate with the regional stratigraphic section. Soil boring logs from the wells installed during the supplemental investigation are located in Appendix IV. The lithology encountered is predominantly a white, pale brown, or light gray, very fine to medium-grained sand, with variable silt and clay content. Generally, the samples with higher silt and clay content were within a few feet of the surface. Less silt and clay content was noted with depth. The boring log of deep well P1-MW40 indicates an increasing clay content from approximately 26 feet BGS to 30 feet BGS, becoming a clayey, coarse-grained sand/gravel at 30 feet BGS.

II.B.3. Stratigraphic Cross Sections

Stratigraphic cross sections have been developed and were presented in the CAP–Part B Report (SAIC 2000).

II.B.4. Geotechnical Analysis

Soil samples were collected for geotechnical analysis during the CAP–Part B investigation, and the results were presented in the CAP–Part B Report (SAIC 2000). In February 2001, soil samples were collected from wells D-MW37 and D-MW39 for various geotechnical analyses. The results are presented in Table 4 and Attachment B.

II.B.5. Direction of Groundwater Flow

II.B.5.a. Well construction details

During the supplemental investigation activities in 2001, each monitoring well casing consisted of 4-inch inside diameter, Schedule 40, flush-threaded polyvinyl chloride risers with a 10-foot screen set across the water table. The well screen slot size was 0.010 inch. Table 5 summarizes construction details for existing monitoring wells associated with the Former Fuel Pit 1A/DAACG area and the wells installed at the site during the supplemental investigation in February 2001. The existing wells were resurveyed in February 2001 so that the reference datum for all the wells was consistent. Well construction diagrams for wells D-MW33 through D-MW43 are presented in Appendix VII.

Following installation of the well casing, filter pack sand was poured while the augers were gradually removed to ensure a complete and even distribution of the filter pack. The filter pack extended to a measured level at least 2 feet above the top of the well screen. Well seals were composed of bentonite pellets and allowed to hydrate before filling of the annular space above the seal. The well seal extended to a measured level of at least 2.0 feet above the top of the filter pack. Above the well seal, the remaining annular space was completed with a 1.0-foot-long, flush-mounted, sheet-steel protective casing that was grouted in place with a concrete pad. Well casings were capped with expandable locking caps. Protective casings were covered with bolted cast-iron manhole covers. Inscribed monitoring well identification plates were placed inside each manhole cover.

II.B.5.b. Potentiometric mapping

During the supplemental investigation activities, water level measurements were collected from 18 existing monitoring wells and from the 11 newly installed monitoring wells in March 2001. Data obtained from these measurements are presented in Table 3. Groundwater in the study area is under water table conditions and is encountered between 8.12 feet and 12.81 feet BGS, at an average of 10.6 feet BGS. Figure 13 shows the potentiometric surface at the site in March 2001. Groundwater flow in the vicinity of the Former Fuel Pit 1A/DAACG area is to the northwest at a gradient of approximately 0.0086 foot/foot.

II.B.5.c. Equipotential flow net

Equipotential flow nets based on March 2001 water level measurements and the contoured potentiometric surfaces are presented in Figure 13 for the shallow and deep surficial portions of the aquifer.

III. REMEDIAL ACTION PLAN

III.A. CORRECTIVE ACTION COMPLETED OR IN PROGRESS

III.A.1. Recovery/Removal of Free Product

During sampling activities in February 2000, free product was measured in wells D-MW1, D-MW2, D-MW8, D-MW11, D-MW13, and D-MW17 at thicknesses of 0.01 foot, 0.88 foot, 0.15 foot, 0.74 foot, 0.15 foot, and a sheen, respectively. Absorbent socks were placed in each well following these measurements on February 24, 2000. The free product covered an area of approximately 400 feet by 500 feet at the Former Fuel Pit 1A/DAACG area (Release #1) in February 2000. GA EPD was notified of the free product in correspondence dated March 8, 2000 (Stanley 2000).

The absorbent socks were removed and replaced in wells with free product on a bimonthly basis from May 2000 through July 2001. Absorbent sock removal and replacement was discontinued in several perimeter wells between December 2000 and May 2001 due to a lack of free product. Field bailout tests were conducted in March 2001 and July 2001 to determine the amount of recoverable product. In July 2001, the dimensions of the free product plume were similar to those of February 2000. Bimonthly replacement of the absorbent socks will continue until a corrective action is implemented to remove the free product.

III.A.2. Remediation/Treatment of Contaminated Backfill Material and Native Soil

During UST closure activities in 1995, all contaminated soil removed during the project was tested in accordance with disposal facility requirements and transported to Kedesh, Inc., Highway 84, Ludowici, GA 31316. The closure report for Former Pumphouse #1 was not submitted to GA EPD in 1995 because review of the closure analytical data indicated that a CAP–Part A would be required (in accordance with requirements of GUST-9, Item 15, page 12, dated August 1995). However, the analytical data presented in the closure report were summarized in the CAP–Part B Report. Approximately 913 cubic yards of contaminated soil were excavated from the site.

During the UST closure activities in 1998, the excavated soil was returned to the tank pit with the concurrence of GA EPD. The 1998 closure report for Former Pumphouse #1 (Earth Tech 1998) was not submitted to GA EPD because the CAP–Part A Report, which incorporated the area of the removal activities, had already been submitted to GA EPD.

III.B. OBJECTIVES OF CORRECTIVE ACTION

III.B.1. Remove Free Product That Exceeds One-Eighth Inch at the Former Fuel Pit 1A/DAACG Area (Release #1)

In February 2000, free product in excess of 1/8 inch in thickness was observed in wells D-MW1, D-MW2, D-MW8, D-MW11, D-MW13, and D-MW17. Since February 2000, free product has been removed via absorbent socks replaced on a bimonthly basis. The thickest amount of free product is located near the southwestern boundary of the product plume in the vicinity of wells D-MW2, D-MW34, and D-MW35. Field bailout tests indicate that there are approximately 3,000 gallons to 5,000 gallons of recoverable free product at the Former Fuel Pit 1A/DAACG area. More than half of the free product plume is located north and east of the flight line barricades, underneath an active tarmac that is associated with military flight operations. The thicknesses underneath the active tarmac range from 0.01 foot to 0.04 foot.

However, the area in which the free product plume is the thickest (i.e., up to 0.32 foot actual thickness) is located southwest of the flight line barricades and is accessible without being impacted by flight line operations or without impacting flight line operations during remedial activities. It is recommended that additional free product removal activities be implemented at the site in the area southwest of the flight line barricades.

III.B.2. Remediate Groundwater Contamination at the Former Fuel Pit 1A/DAACG Area (Release #1)

As discussed in the CAP–Part B Report (SAIC 2000), previous investigations documented benzene contamination in groundwater at the Former Fuel Pit 1A/DAACG area (Release #1) at concentrations that exceeded the IWQS of 71.28 µg/L and the ACL of 285 µg/L.

The supplemental groundwater sampling conducted in March 2001 indicated that the benzene plume was similar to the plume that had been observed during the CAP–Part A and CAP–Part B investigations. The benzene concentrations in 12 wells exceeded the IWQS. The benzene concentrations in D-MW2, D-MW34, D-MW35, D-MW37, and D-MW39 exceeded the ACL. These wells are located southwest of the flight line barricades where the free product is the thickest. The majority of the groundwater plume extends 400 feet north and 300 feet east of the flight line barricades, underneath an active tarmac that is associated with military flight operations; however, the benzene concentrations underneath the active tarmac do not exceed the benzene ACL. Active remediation of the entire groundwater plume will impact active military operations. However, the majority of the groundwater contamination north and east of the flight line barricades is less than the benzene ACL. Therefore, it is recommended that a groundwater corrective action be implemented at the site in the area located southwest of the flight line barricades where benzene concentrations exceed the ACLs.

A large area of the groundwater plume exists underneath an active tarmac; therefore, the corrective action for the groundwater plume at the Former Fuel Pit 1A/DAACG area should consist of alternatives that are protective of the environment but can be implemented in a manner that causes minimal disruption of the active military flight operations. Monitored natural attenuation appears to be the most viable alternative once the free product has been removed because (1) the free product continues to act as a source for the groundwater contamination, (2) the benzene concentrations underneath the active tarmac are below the ACL, and (3) the maximum benzene concentrations during the CAP–Part B and supplemental investigations were less than three times the ACL. Monitored natural attenuation would provide for monitoring of the groundwater plume without impacting the military flight operations. It is recommended that the corrective action for groundwater consist of free product removal and monitored natural attenuation of the groundwater plume in the vicinity of the Former Fuel Pit 1A/DAACG area.

III.B.3. Remediate Soil Contamination at the Former Fuel Pit 1A/DAACG Area (Release #1)

As discussed in the CAP–Part B Report (SAIC 2000), previous investigations documented that benzene, toluene, ethylbenzene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, chrysene, and indeno(*1,2,3-cd*)pyrene contamination in soil at the Former Fuel Pit 1A/DAACG area (Release #1) exceeded the applicable GUST STLs. Benzene was the only constituent in soil to exceed its ATL of 9.3 mg/kg in six boring locations. Benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene concentrations in one soil sample exceeded the ATLs of 1.4 mg/kg, 2.1 mg/kg, and 0.66 mg/kg, respectively. The soil samples with these concentrations exceeding the ATLs were collected from the capillary fringe above the soil/water interface in the area of free product, and the presence of free product may have contributed to the high concentrations. The soil contamination exceeding ATLs follows the area of free product and groundwater contamination, and a large portion is located north and east of the flight line barricades, underneath an

active tarmac that is associated with military flight operations. Active remediation of the soil contamination north and east of the flight line barricades will impact active military operations.

It is recommended that the corrective action for removal of the free product be implemented prior to recommendation of a corrective action for the soil contamination. Once the majority of the free product has been removed, additional soil borings should be installed north and east of the flight line barricades to determine if the soil concentrations have degraded to below the ATLs.

III.B.4. Provide Risk-Based Corrective Action

A risk-based approach was used in the CAP–Part B Report (SAIC 2000) to identify chemicals of potential concern (COPCs) for soil and groundwater and to develop ATLs and ACLs for various constituents. The results of the risk screening for both areas were presented in the CAP–Part B Report (SAIC 2000) and the results for the Former Fuel Pit 1A/DAACG area are summarized below.

In summary, benzene, ethylbenzene, toluene, xylenes, benzo(*a*)pyrene, benzo(*b*)fluoranthene, chrysene, and indeno(*1,2,3-cd*)pyrene were identified as COPCs for soil. ATLs of 9.3 mg/kg for benzene, 187 mg/kg for ethylbenzene, 479 mg/kg for toluene, 893 mg/kg for xylenes, 1.4 mg/kg for benzo(*a*)pyrene, 5.8 mg/kg for benzo(*b*)fluoranthene, 2.1 mg/kg chrysene, and 0.66 mg/kg for indeno(*1,2,3-cd*)pyrene were proposed in the CAP–Part B Report (SAIC 2000) and approved by GA EPD in correspondence dated December 18, 2000 (Logan 2000). Benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene were the constituents that exceeded their respective ATLs during the CAP–Part A and Part B investigations.

Benzene, ethylbenzene, toluene, benzo(*a*)pyrene, chrysene, and naphthalene were identified as COPCs for groundwater. ACLs of 285 µg/L for benzene; 114,800 µg/L for ethylbenzene; 800,000 µg/L for toluene; 1.2 µg/L for benzo(*a*)pyrene; 1.2 µg/L for chrysene; and 260 µg/L for naphthalene were proposed in the CAP–Part B Report (SAIC 2000) and approved by GA EPD in correspondence dated December 18, 2000 (Logan 2000). Benzene was the only compound to exceed its respective ACL during the CAP–Part B investigation.

The fate and transport modeling results were provided in the CAP–Part B Report (SAIC 2000). A storm drain located 230 feet northeast (downgradient) of the site is the nearest possible location at which a receptor might encounter migrating groundwater contamination due to a possible hydraulic connection between the groundwater and the potential receptor. Modeling of leaching to groundwater by percolating rainwater was performed using the Seasonal Soil Compartment Model to determine the predicted maximum concentration in the leachate at the water table interface. The predicted leachate concentration of 12,500 µg/L was above the maximum groundwater concentration of 700 µg/L at the source. The Analytical Transient 1-, 2-, 3-Dimensional Model was calibrated to the maximum predicted concentration of benzene (i.e., 12,000 µg/L) assuming a steady-state (continuous) concentration at the source.

Based on modeling results, the estimated dilution attenuation factor for benzene at the storm drain was 4.0. The modeling results indicated that benzene should be reaching the storm drain at a concentration of 3,100 µg/L, which is above the state IWQS of 71.28 µg/L, thereby predicting that the potential receptor is impacted by the current site conditions. However, actual groundwater results indicated that groundwater contamination at concentrations near the IWQS reaches the storm drain. Due to the close proximity of both releases to each other, the most conservative fate and transport modeling results were used for developing one set of ACLs and ATLs for both areas of contamination.

Considering the site characteristics, it was recommended that the free product, soil contamination above ATLs, and groundwater contamination above ACLs in the vicinity of the Former Fuel Pit 1A/DAACG

area be addressed. However, additional information was necessary to determine the amount of recoverable free product at the Former Fuel Pit 1A/DAACG area prior to proposal of remediation systems for the site.

III.C. DESIGN AND OPERATION OF CORRECTIVE ACTION SYSTEMS AT THE FORMER FUEL PIT 1A/DAACG AREA (RELEASE #1)

III.C.1. System Effectiveness/Basis for Selection

The presumed remedies evaluated for aromatic hydrocarbons in soil and groundwater at the Former Fuel Pit 1A/DAACG area included free product removal, monitored natural attenuation, oxygen-injection-enhanced bioremediation, air sparging with soil vapor extraction, six-phase heating, and PHOSter® II enhanced bioremediation. The primary focus of the alternative evaluation was to find a cost-effective method of remediating the site with minimal impact to the military flight operations. Active remediation of the majority of the soil and groundwater contamination north and east of the flight line barricades would either impact military flight operations for a significant period of time or not be cost effective to implement because of the requirements that would be necessary to minimize the impact to flight operations. The majority of the recoverable free product is located southwest of the flight line barricades where an active product removal system would not impact military flight operations.

In selecting the corrective action for the Former Fuel Pit 1A/DAACG area, the following items were taken into consideration: (1) the free product is acting as a continuous source for soil and groundwater contamination, (2) the benzene concentrations in groundwater above the ACL are located southwest of the flight line barricades, (3) the benzene concentrations in groundwater are less than three times the ACL, and (4) the soil contamination is primarily associated with the interval above the soil/water interface where the free product is located. Based on these considerations and the active military flight operations, a phased approach to the corrective action is recommended for the Former Fuel Pit 1A/DAACG area. The first phase will consist of removing the free product without impacting active military flight operations. The second phase will consist of monitored natural attenuation of the groundwater plume. Once the removal of the free product reaches an asymptotic level and the results of the monitored natural attenuation can be evaluated, HAAF will reevaluate the need for an active corrective action addressing any remaining soil and groundwater contamination.

III.C.1.a. Theory and feasibility

Data indicate that free product is floating on the groundwater at the Former Fuel Pit 1A/DAACG area, dissolved-phase hydrocarbons exist in the groundwater beneath the site, and residual saturation of hydrocarbons exists in soil at the site. The seasonal water table fluctuations of approximately 2 feet have further transported and smeared free-phase petroleum product onto soil. The BTEX compounds are both volatile and aerobically degradable by bacteria, which already exist in the subsurface.

The results of the field bailout tests indicate that there are approximately 3,000 gallons to 5,000 gallons of free product that can be recovered from the Former Fuel Pit 1A/DAACG area (Release #1). The majority of the recoverable free product is located southeast of the flight line barricades and is not within the area of active military flight operations. The free product should be removed from the subsurface so that the site conditions will be favorable to biodegradation.

The large quantity of free product in the subsurface at the Former Fuel Pit 1A/DAACG area is providing a continuous source of contamination that is dissolving into the groundwater at the site. Active free product removal in conjunction with groundwater extraction will locally depress the water table to create a cone

of depression that will collect the free product and expedite its removal. In addition, groundwater extraction will expedite cleanup by removing dissolved-phase contamination. The groundwater can be easily treated by an oil/water separator and air stripper and discharged via an infiltration gallery or to a sanitary sewer.

Once the source has been removed, the subsurface conditions (dissolved oxygen, oxidation-reduction potential, background nutrient availability) will steadily improve with time. Natural attenuation may be an adequate alternative to monitoring the subsurface contamination without impacting active military flight operations. Natural attenuation is based on the premise that fuel-type hydrocarbons are readily biodegraded in most environmental systems. Biodegradation of BTEX has been documented for sites similar to the Former Fuel Pit 1A/DAACG area (e.g., shallow water table, permeable silty sand). In fact, the conditions at this site are similar to those of other sites that have proven ideal for biodegradation (Abou-Rizk et al. 1995). Groundwater samples were collected from wells at the Former Pumphouse #1 tank pit area (Release #2) in 1999 to determine whether natural attenuation of hydrocarbons was occurring. The results of the preliminary screening for aerobic and anaerobic biodegradation suggest that conditions are favorable for natural attenuation of aromatic hydrocarbons. Due to the close proximity of the releases to each other, it is reasonable to assume that biodegradation of aromatic hydrocarbons will also occur at the Former Fuel Pit 1A/DAACG area (Release #1) once the free product is removed.

During the 2001 investigation, the Georgia IWQS for benzene of 71.28 µg/L was exceeded in 12 monitoring wells. However, only five of the wells contained benzene concentrations that exceeded the GA EPD–approved benzene ACL of 285 µg/L. HAAF proposes to implement free product removal activities on the southeastern side of the flight line barricades in conjunction with monitored natural attenuation of the groundwater plume.

III.C.1.b. Remediation system

The Former Fuel Pit 1A/DAACG area is located underneath a tarmac associated with active military flight operations. The proposed first phase of the corrective action is a remediation system consisting of groundwater extraction and free product removal. The area of the free product that is thickest is located southeast of the flight line barricades, and the remediation system has been designed to cause minimal impact to the active flight operations.

Wells D-MW34 and D-MW35 will be used as groundwater extraction and free product recovery wells. In addition, another 4-inch well will be installed between these two wells for groundwater extraction and free product recovery. Groundwater will be extracted with electric submersible pumps, and free product will be removed with product recovery systems (i.e., Spillbuster, Ferret™, or equivalent). The free product will be pumped into an aboveground storage tank located at each well. The three groundwater discharge lines will manifold together near the treatment unit. Individual valves and flow meters will be included. A combined system flow rate of 9 gpm to 15 gpm is expected. Groundwater will be routed through an oil/water separator and then through an air stripper where the dissolved phase hydrocarbons will be removed and discharged directly to the atmosphere. No off-gas treatment from the air stripping unit is anticipated. The treated groundwater will be discharged via an infiltration gallery or to a sanitary sewer. Seven additional wells will be installed around the perimeter of the thickest portion of the free product plume to better define the volume of free product and the progress of the free product removal.

In conjunction with the free product removal and groundwater extraction, a monitoring only program will be implemented for the Former Fuel Pit 1A/DAACG area and will consist of annual sampling of up to 30 wells.

A plan view of the proposed well locations for the remediation system is presented in Figure 14. The process flow diagram for the system is presented in Figure 15. Any changes to the remediation system proposed in this document will be submitted to GA EPD.

III.D. IMPLEMENTATION

III.D.1. Milestone Schedule

A milestone schedule for the proposed corrective action has been prepared. A Gantt chart showing milestone activities and anticipated duration is provided in Figure 16. The actual time required to achieve asymptotic free produce recovery may be greater, or less, than presented in Figure 16; therefore, Fort Stewart will notify GA EPD USTMP of any significant changes to the schedule and will provide GA EPD USTMP with an updated Gantt chart as necessary.

III.D.2. Progress Reporting

For the Former Fuel Pit 1A/DAACG area (Release #1), annual progress reports or monitoring reports will be submitted to GA EPD that will summarize the free product removal activities and all previous sampling events for that time period. If scheduling permits, the annual progress report for the Former Fuel Pit 1A/DAACG area (Release #1) may be combined with the annual monitoring only report for the Former Pumphouse #1 tank pit area (Release #2) to create a single document.

III.D.3. Certificate of Completion Report

Petition for permanent closure will be submitted with the final progress report (i.e., completion report) for the first release to reach closure criteria. An addendum to the completion report will be submitted for the second release to reach the GA EPD–approved closure criteria. GA EPD will provide final approval for decommissioning the monitoring wells, which will be requested in the final completion addendum report. Decommissioning of the monitoring wells will be completed in accordance with the USACE design manual for monitoring wells. Decommissioning will comply with all applicable state and federal standards.

The following certification will be submitted to GA EPD within 30 days of submittal of the final progress report:

> I hereby certify that the Corrective Action Plan–Part B, dated ___, 20_, for Hunter Army Airfield, Former Pumphouse #1 site (Release #1 and Release #2), Facility ID 9-025085, including any and all certified amendments/addenda thereto, has been implemented in accordance with the schedules, specifications, sampling programs, and conditions contained therein and that the plan's stated objectives have been met.
>
> _____
> Signature (Owner/Operator)

III.D.4. Inspection Schedule and Preventative Maintenance Program

For the Former Fuel Pit 1A/DAACG area (Release #1), the preventative maintenance for the remediation system will be performed in accordance with the maintenance schedule provided in the Gantt chart. Initial startup tests and system calibrations will be conducted upon installation of the system. Site visits will be conducted biweekly for the first 2 months of operation. Depending on system performance, maintenance visits may be reduced to monthly for the remaining period of system operation. Selected personnel from HAAF will also be trained in operation of the system and adjustment procedures so that more frequent visits can be conducted if required.

The systems will be operated in accordance with the manufacturers' specifications. Anticipated system adjustments/servicing will include the items listed below.

- Adjust pumping rates from groundwater extraction wells to achieve desired drawdown.
- Check treatment units for fouling.
- Collect effluent water samples. Based on analytical results, adjust treatment units to ensure design removal efficiency is achieved.

Also, during each sampling event, wells and exposed piping and instrumentation will be visually inspected for changes or damage. Any notable observations will be recorded in the subsequent progress report.

III.D.5. Periodic Monitoring

For the Former Fuel Pit 1A/DAACG area (Release #1), groundwater samples will be collected annually from up to 30 wells (D-MW1, D-MW2, D-MW8, D-MW11, D-MW12, D-MW13, D-MW17, D-MW18, D-MW19, D-MW22, D-MW33, D-MW34, D-MW35, D-MW36, D-MW37, D-MW38, D-MW39, D-MW40, D-MW41, D-MW42, D-MW43, P1-MW11, P1-MW12, P1-MW13, P1-MW42, and five of the proposed wells) and analyzed for BTEX. PAH compounds observed during the CAP–Part A and CAP–Part B investigations were detected at concentrations below their respective ACLs; therefore, it is recommended that PAH analysis not be performed during the annual sampling. Monitoring will continue at the site until the recovery of free product reaches diminishing returns and the benzene concentrations in groundwater are below the ACL of 285 µg/L for two sampling events. Wells may be added or removed from the monitoring plan as the boundaries of the plume change. These changes will be documented in the monitoring only reports.

During each sampling event, water levels will be measured in all monitoring wells. Specific conductivity, pH, and temperature analyses will be measured on each sample from the monitoring wells from which analytical samples are collected. The samples will be shipped to an approved laboratory for BTEX analysis in accordance with U.S. Environmental Protection Agency Method 8021B/8260B and GA EPD laboratory certification requirements.

The tarmac associated with Taxiway 3 is scheduled to be replaced, which will result in the destruction of numerous wells in the vicinity of Former Pumphouse #1 and the DAACG. Wells required for effective remediation of monitored natural attenuation will be replaced. The destroyed wells will be documented in a progress report or monitoring only report.

III.D.6. Effectiveness of Corrective Action

For the Former Fuel Pit 1A/DAACG area (Release #1), the corrective action (i.e., active product recovery followed by monitored natural attenuation) will be discontinued once the objectives of the monitoring only plan have been achieved—the recovery of free product has reached a diminishing return; the benzene concentrations in groundwater are below the ACL of 285 µg/L; and the benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene concentrations in soil are reduced to below their ATLs of 9.3 mg/kg, 1.4 mg/kg, 2.1 mg/kg, and 0.66 mg/kg, respectively.

III.D.7. Confirmatory Soil Sampling Plan

For the Former Fuel Pit 1A/DAACG area (Release #1), no excavation of soil is planned under the free product removal and monitoring only plan; therefore, confirmatory sampling associated with excavation of soil will not be performed. However, because there is an area of soil contamination that exceeds the benzene ATL of 9.3 mg/kg, the benzo(*a*)pyrene ATL of 1.4 mg/kg, the chrysene ATL of 2.1 mg/kg, and the indeno(*1,2,3-cd*)pyrene ATL of 0.66, three confirmatory soil samples will be collected from the area of soil contamination. The soil samples will be collected once the benzene concentrations in groundwater are approaching the ACL. The soil samples will be analyzed for only benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene only. The location of these samples will be determined during the monitoring only program and will be submitted to GA EPD in a letter or annual monitoring only report for approval.

III.D.8. Stockpiled Bulk Soil Sampling

For the Former Fuel Pit 1A/DAACG area (Release #1), no stockpiled soil will be generated by this corrective action; therefore, no soil sampling will be conducted.

III.D.9. Monitoring Only Termination Conditions

For the Former Fuel Pit 1A/DAACG area (Release #1), concentrations of benzene in groundwater must be at or below the ACL, and concentrations of benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene in soil must be at or below their respective ATLs prior to termination of the monitoring only program. Once the product removal activities have reached a diminishing return and the benzene ACL and the benzene, benzo(*a*)pyrene, chrysene, and indeno(*1,2,3-cd*)pyrene ATLs have been achieved, the remedial system and monitoring may be terminated regardless of the site ranking score.

III.D.10. Post-Completion Site Restoration Activities

After termination has been granted for either release, equipment and debris related to the corrective action will be removed from the site.

III.E. PUBLIC NOTIFICATION

The Former Pumphouse #1 site is located entirely within the confines of HAAF, which is part of the Fort Stewart Military Reservation, a federal facility. The U.S. Government owns all of the property contiguous to the site. The Fort Stewart DPW has complied with the public notice requirements defined by GA EPD guidance by publishing an announcement in the *Savannah Morning News* on April 1 and 8, 2001. A copy of the newspaper announcement used for public notification is presented in Appendix XI of this report.

IV. CLAIM FOR REIMBURSEMENT

HAAF is a federally owned facility and has funded the investigation for the Former Pumphouse #1 site, Facility ID #9-025085 using Department of Defense Environmental Restoration Funds. Application for GUST Trust Fund reimbursement is not being pursued at this time.

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APPENDIX I

REPORT FIGURES

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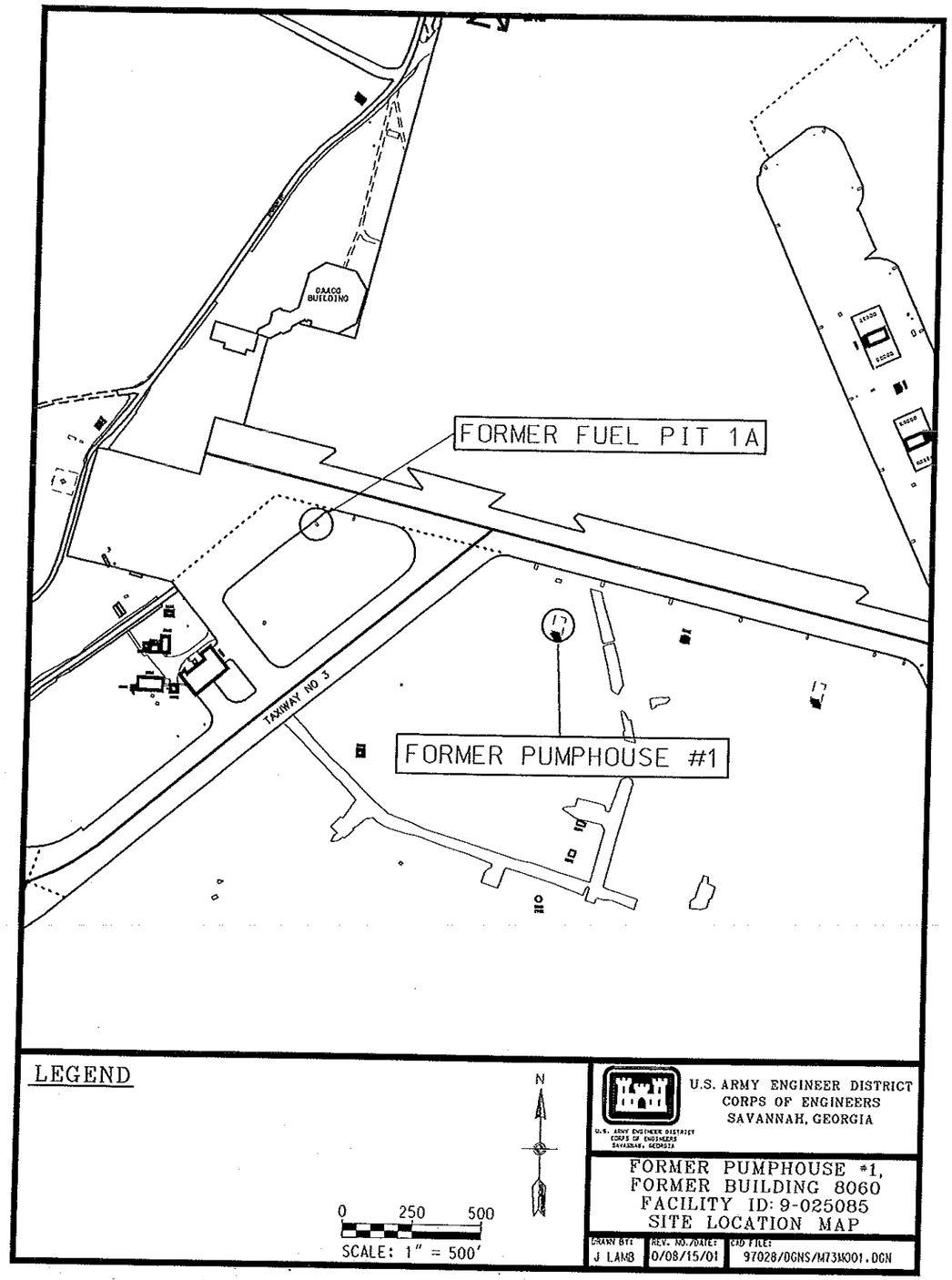


Figure 1. Location Map for the Former Pumphouse #1 Site, Facility ID #9-025085

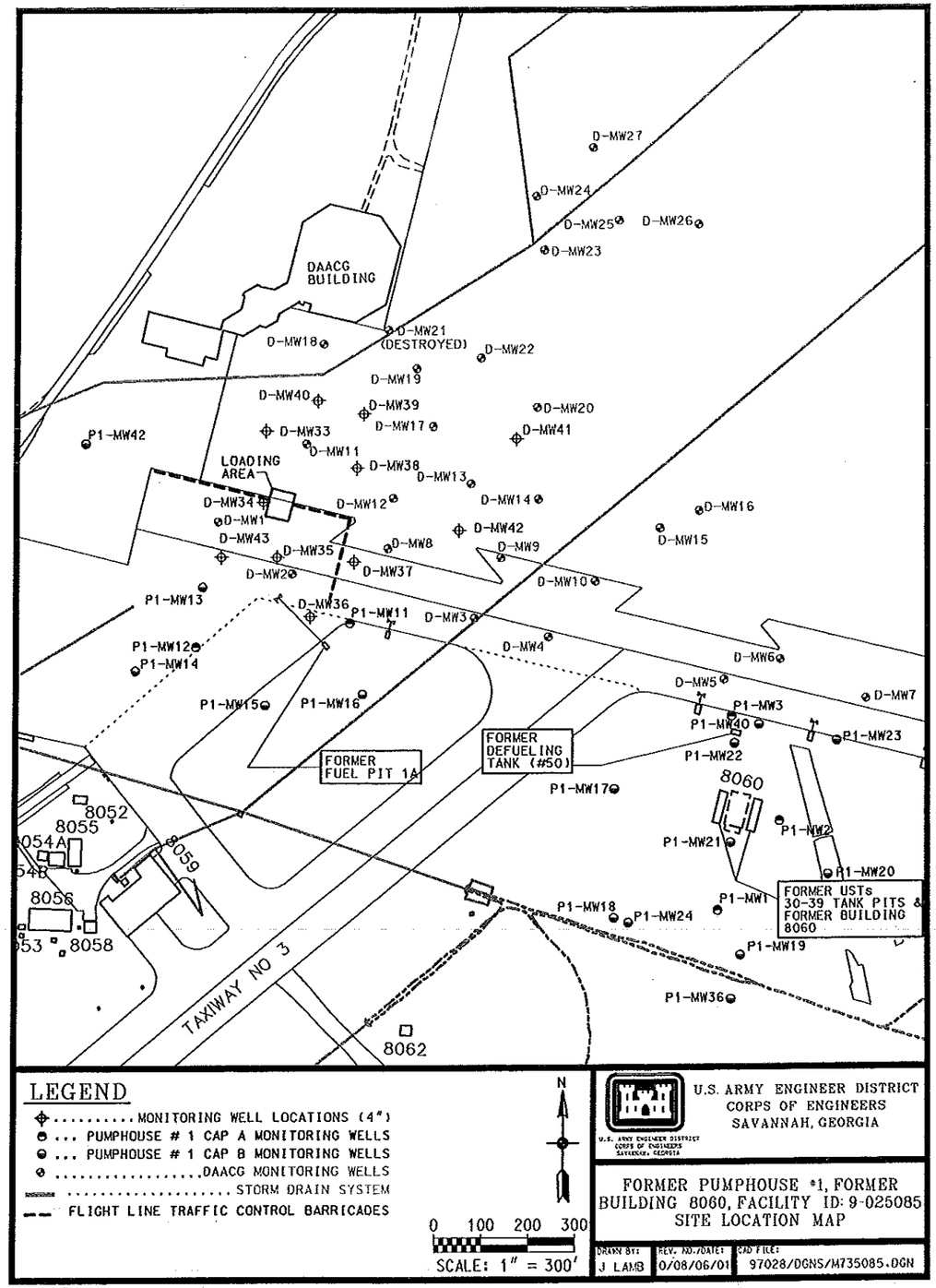


Figure 2. Site Map of Former Pumphouse #1 Site, Facility ID #9-025085

D-MW33	
AK3311	5.0 - 7.5 FT
Benzene	<0.269
Toluene	<0.269
Ethylbenzene	0.464
Xylenes, Total	0.456

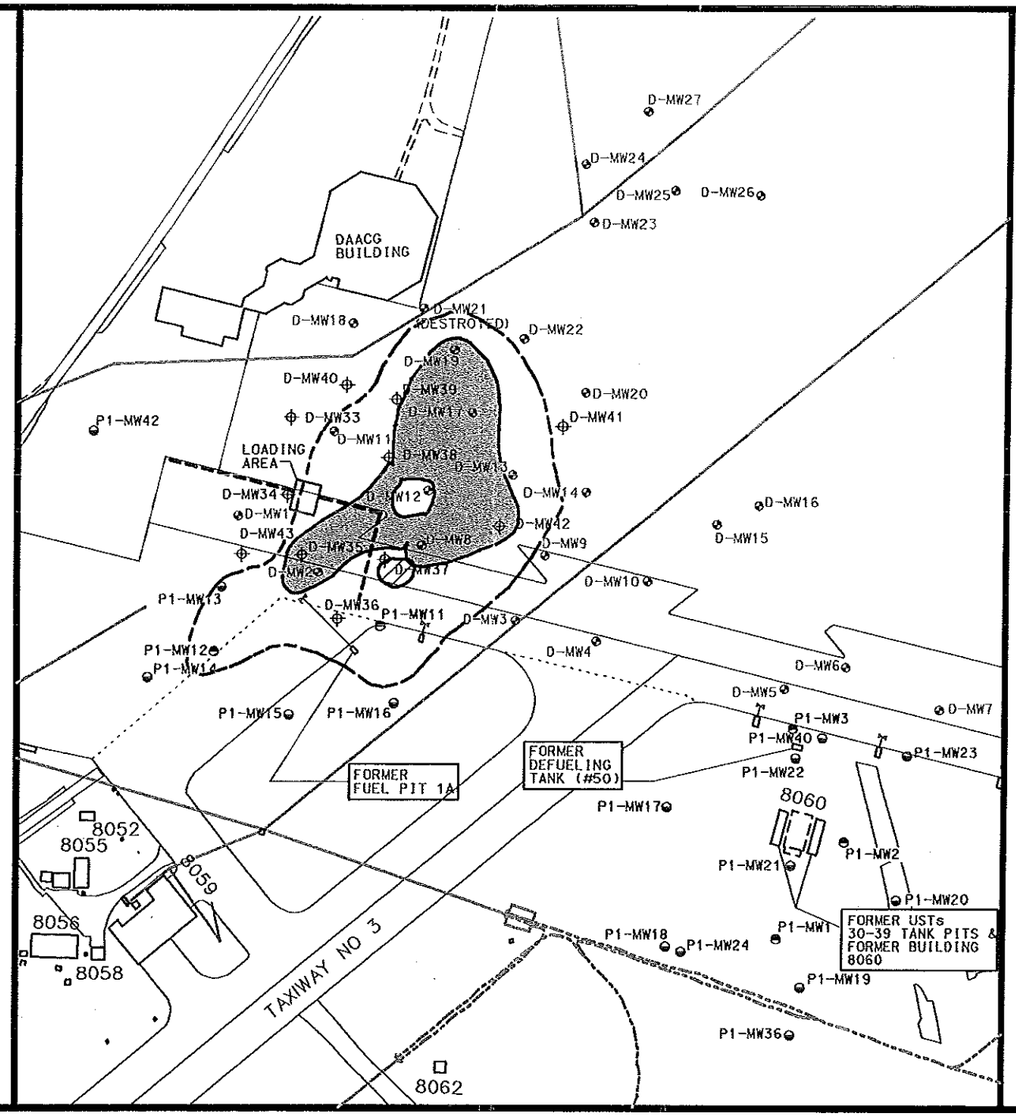
D-MW34	
AK3411	10.0 - 12.5 FT
Benzene	<0.22
Toluene	5.51
Ethylbenzene	4.32
Xylenes, Total	17.8
Pyrene	0.0141 J

D-MW35	
AK3511	11.0 - 12.5 FT
Benzene	<11.3
Toluene	2550
Ethylbenzene	355
Xylenes, Total	1860
Anthracene	0.0133 J
Fluoranthene	0.0688
Fluorene	0.0722
Naphthalene	0.828

D-MW36	
AK3611	5.0 - 7.0 FT
Benzene	1.44 J
Toluene	74.4
Ethylbenzene	16.2
Xylenes, Total	80.9

D-MW37	
AK3711	10.0 - 12.0 FT
Benzene	1.3
Toluene	45.6
Ethylbenzene	3.87
Xylenes, Total	15.7
Naphthalene	0.147

D-MW38	
AK3811	10.0 - 11.5 FT
Benzene	<0.131
Toluene	<0.196
Ethylbenzene	0.58
Xylenes, Total	3.93
Fluorene	0.0188 J



D-MW39	
AK3911	7.0 - 11.0 FT
Benzene	<0.232
Toluene	0.0949 J
Ethylbenzene	1.24
Xylenes, Total	3.08
Fluoranthene	0.0095 J

D-MW40	
AK4011	10.0 - 12.5 FT
Benzene	<1.48
Toluene	0.381 J
Ethylbenzene	0.345 J
Xylenes, Total	13.3

D-MW41	
AK4111	10.0 - 12.5 FT
Benzene	0.00048 J
Xylenes, Total	0.0015 J

D-MW42	
AK4211	7.0 - 9.2 FT
Toluene	0.0087
Ethylbenzene	0.136 J
Xylenes, Total	0.593
Acenaphthene	0.0186 J
Anthracene	0.0209 J
Benzo(a)anthracene	0.0256 J
Chrysene	0.0207 J
Fluoranthene	0.0901
Fluorene	0.0203 J
Phenanthrene	0.119
Pyrene	0.0675

D-MW43	
AK4311	7.0 - 9.2 FT
NO DETECTS	

LEGEND

- ⊕ ..... MONITORING WELL LOCATIONS (4")
- ⊕ .... PUMPHOUSE # 1 CAP A MONITORING WELLS
- ⊕ ..... PUMPHOUSE # 1 CAP B MONITORING WELL
- ⊕ ..... DAACG MONITORING WELLS
- ..... STORM DRAIN SYSTEM
- --- FLIGHT LINE TRAFFIC CONTROL BARRICADES

- ..... ESTIMATED LIMIT OF BENZENE CONTAMINATION ABOVE STL
- ..... ESTIMATED LIMIT OF BENZENE CONTAMINATION ABOVE ATL
- ..... ESTIMATED LIMIT OF PAH CONTAMINATION ABOVE ATL

NOTES:
1. CONCENTRATION IN mg/mg.
2. BLUE VALUES EXCEED STLs.
3. RED VALUES EXCEED ATLs.

	STL (mg/kg)	ATL (mg/kg)
Benzene	0.017	9.3
Toluene	115	479
Ethylbenzene	118	187
Xylenes, Total	700	893
Acenaphthene	NONE	NONE
Anthracene	NONE	NONE
Benzo(a)anthracene	0.66	NONE
Chrysene	0.66	2.1
Fluoranthene	NONE	NONE
Fluorene	NONE	NONE
Naphthalene	NONE	NONE
Phenanthrene	NONE	NONE
Pyrene	NONE	NONE

N

0 150 300

SCALE: 1" = 300'

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FORMER PUMPHOUSE #1, FORMER BUILDING 8060, FACILITY ID:9-025085
SUPPLEMENTAL INVESTIGATION
SOIL ANALYTICAL RESULTS (FEB 2001)

DRAWN BY:	REV. NO./DATE:	CAD FILE:
J LAMB	0/08/07/01	97028/DGNS/M735085A.DGN

Figure 3. Supplemental Investigation Soil Analytical Results for the Former Pumphouse #1 Site, Facility ID #9-025085

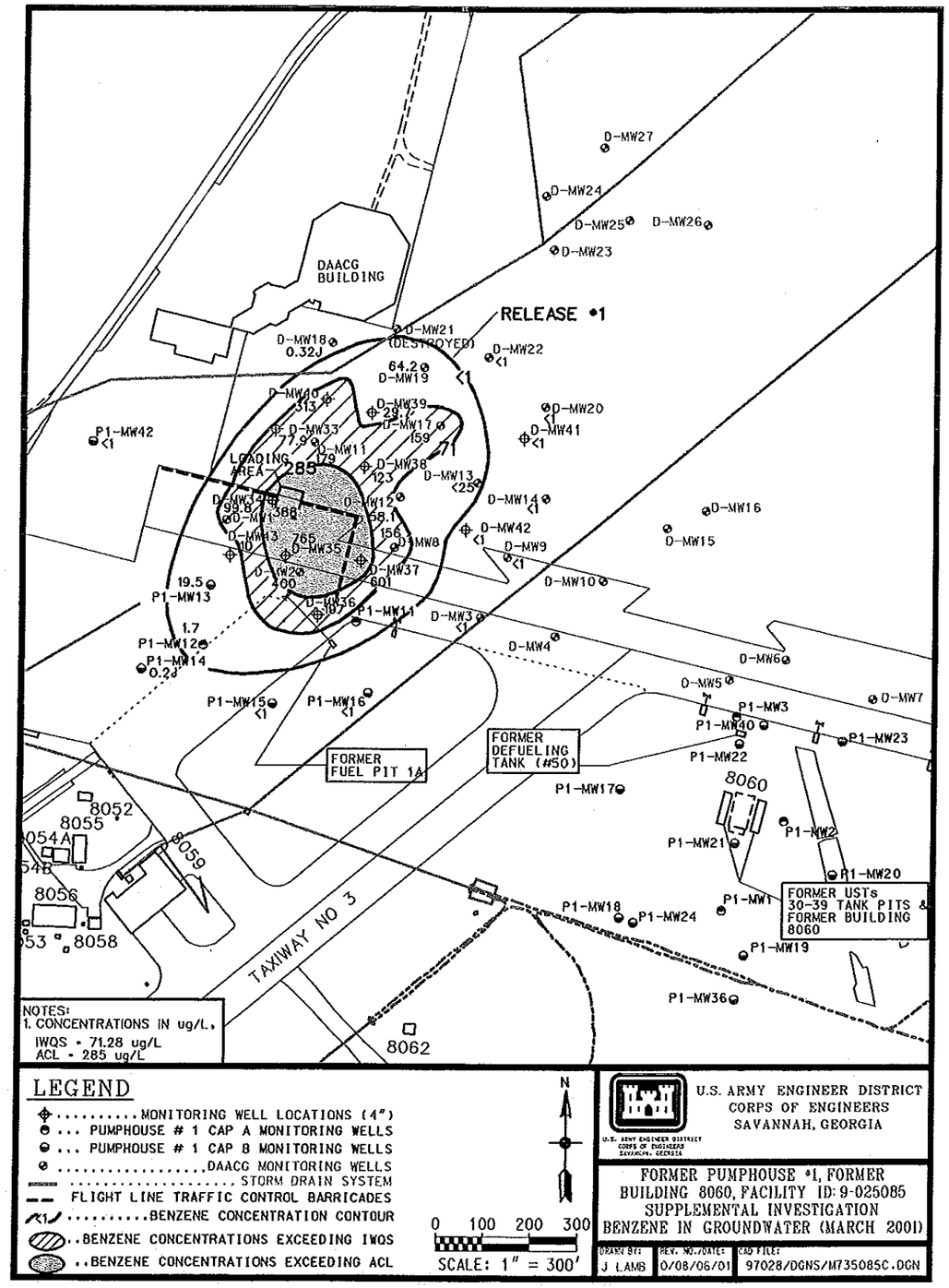


Figure 5. Benzene Groundwater Quality Map (March 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

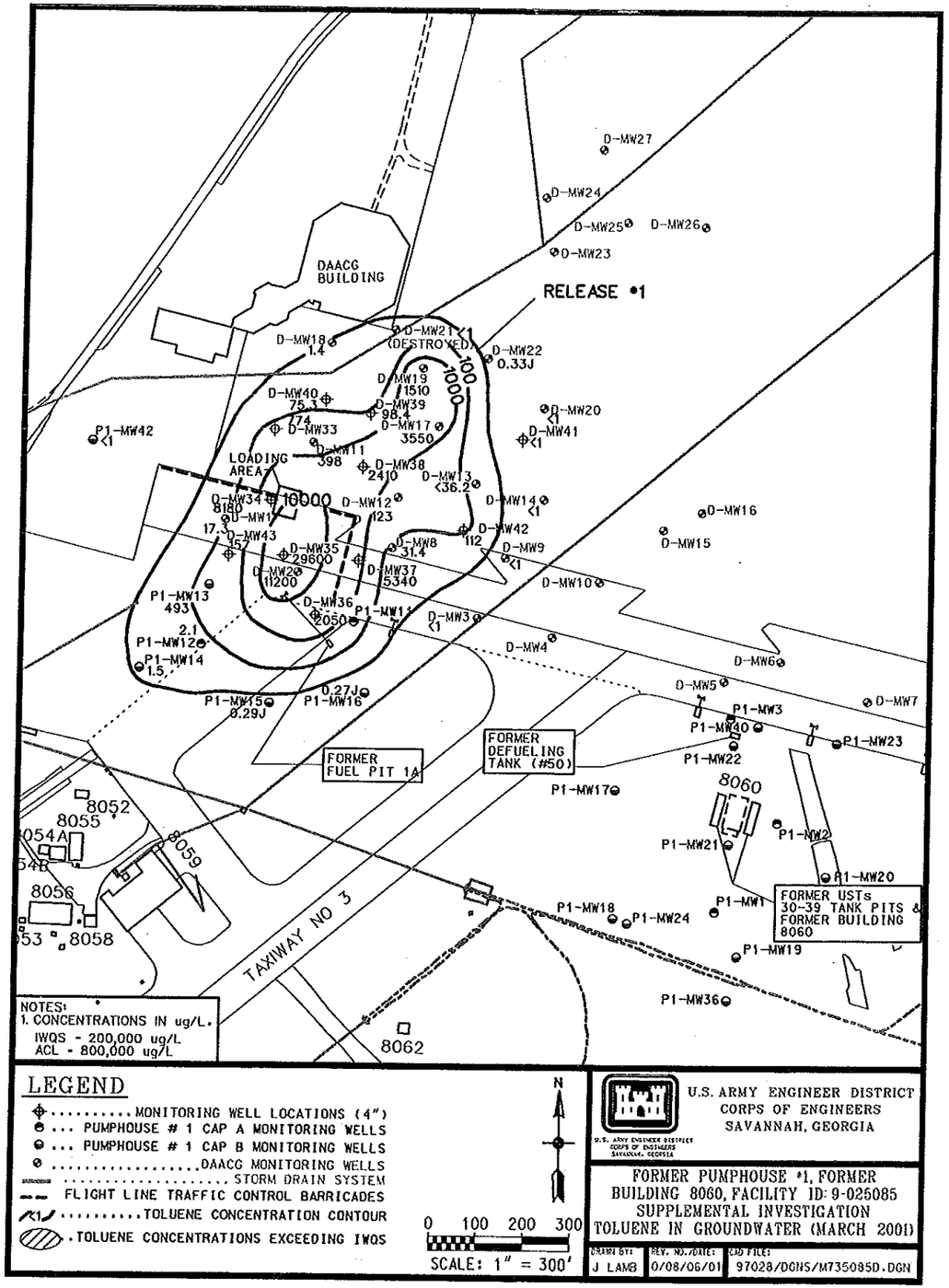


Figure 6. Toluene Groundwater Quality Map (March 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

D-MW01	
AK0122	7.0 - 17.0 FT
Benzene	99.8
Toluene	17.3
Ethylbenzene	119
Xylenes, Total	776

D-MW02	
AK0222	7.6 - 17.6 FT
Benzene	400
Toluene	11200
Ethylbenzene	1050
Xylenes, Total	4940

D-MW03	
AK0322	6.0 - 16.0 FT
Ethylbenzene	0.21 J
Xylenes, Total	0.74 J

D-MW08	
AK0822	7.0 - 17.0 FT
Benzene	156
Toluene	31.4
Ethylbenzene	389
Xylenes, Total	1930

D-MW09	
AK0922	6.0 - 16.0 FT
Xylenes, Total	0.54 J

D-MW11	
AK1122	6.6 - 16.6 FT
Benzene	179
Toluene	398
Ethylbenzene	187
Xylenes, Total	1490

D-MW12	
AK1222	5.6 - 15.6 FT
Benzene	58.1
Toluene	123
Ethylbenzene	222
Xylenes, Total	2020

D-MW13	
AK1322	5.0 - 15.0 FT
Benzene	<25.0
Toluene	<36.2
Ethylbenzene	861
Xylenes, Total	3200

D-MW14	
AK1422	5.0 - 15.0 FT
Ethylbenzene	0.2 J
Xylenes, Total	1.4 J

D-MW17	
AK1722	6.5 - 16.5 FT
Benzene	159
Toluene	3550
Ethylbenzene	364
Xylenes, Total	3250

D-MW18	
AK1822	6.6 - 16.6 FT
Benzene	0.32 J
Toluene	1.4
Ethylbenzene	0.61 J
Xylenes, Total	4.3

D-MW19	
AK1922	6.0 - 16.0 FT
Benzene	64.2
Toluene	1510
Ethylbenzene	365
Xylenes, Total	1450

D-MW20	
AK2022	7.0 - 17.0 FT
NO DETECTS	

D-MW22	
AK2222	6.0 - 16.0 FT
Toluene	0.33 J

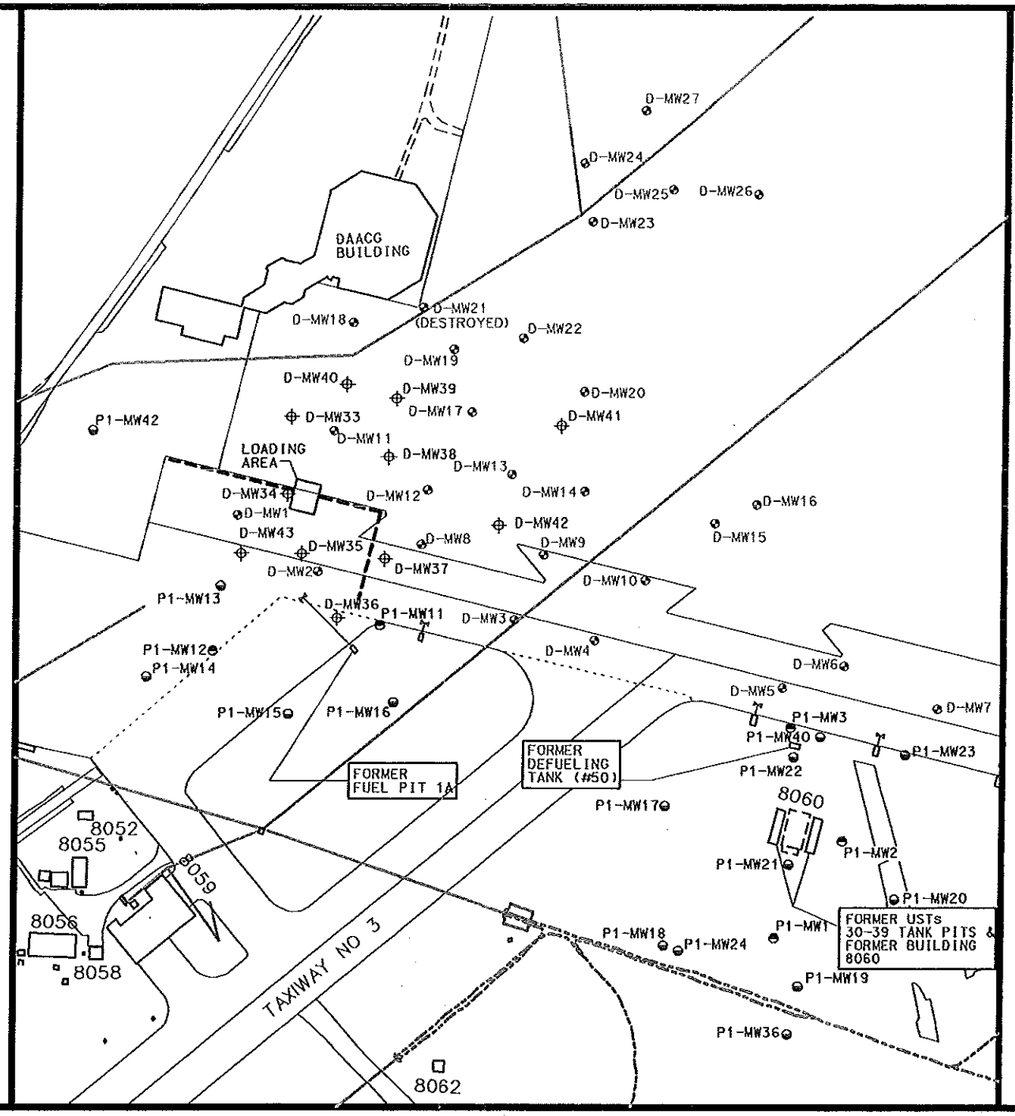
D-MW33	
AK3322	9.0 - 19.0 FT
Benzene	77.9
Toluene	774
Ethylbenzene	470
Xylenes, Total	2060

D-MW34	
AK3422	7.0 - 17.0 FT
Benzene	388
Toluene	8180
Ethylbenzene	1060
Xylenes, Total	4740

D-MW35	
AK3522	7.0 - 17.0 FT
Benzene	765
Toluene	29600
Ethylbenzene	1280
Xylenes, Total	6370

D-MW36	
AK3622	7.0 - 17.0 FT
Benzene	197
Toluene	2050
Ethylbenzene	586
Xylenes, Total	2120

D-MW37	
AK3722	7.0 - 17.0 FT
Benzene	601
Toluene	5340
Ethylbenzene	423
Xylenes, Total	1860



D-MW38	
AK3822	7.0 - 17.0 FT
Benzene	123
Toluene	2410
Ethylbenzene	738
Xylenes, Total	3730

D-MW39	
AK3922	7.0 - 17.0 FT
Benzene	29.7
Toluene	98.4
Ethylbenzene	340
Xylenes, Total	2010

D-MW40	
AK4022	8.0 - 18.0 FT
Benzene	313
Toluene	75.3
Ethylbenzene	959
Xylenes, Total	4230

D-MW41	
AK4122	7.0 - 17.0 FT
Xylenes, Total	0.43 J

D-MW42	
AK4222	7.0 - 17.0 FT
Toluene	112
Ethylbenzene	192
Xylenes, Total	962

D-MW43	
AK4322	7.0 - 17.0 FT
Benzene	10
Toluene	157
Ethylbenzene	36.8
Xylenes, Total	161

P1-MW12	
AN1222	6.5 - 16.5 FT
Benzene	1.7
Toluene	2.1
Ethylbenzene	138
Xylenes, Total	440

P1-MW13	
AN1322	7.0 - 17.0 FT
Benzene	19.5
Toluene	493
Ethylbenzene	182
Xylenes, Total	788

P1-MW14	
AN1422	7.0 - 17.0 FT
Benzene	0.2 J
Toluene	1.5
Ethylbenzene	1.2
Xylenes, Total	6

P1-MW15	
AN1522	6.0 - 16.0 FT
Toluene	0.29 J
Ethylbenzene	0.24 J
Xylenes, Total	1.3 J

P1-MW16	
AN1622	6.0 - 16.0 FT
Toluene	0.27 J

P1-MW42	
AN4222	5.6 - 15.6 FT
Xylenes, Total	0.48 J

LEGEND

- ⊕ .....MONITORING WELL LOCATIONS (4")
- ⊕ .....PUMPHOUSE # 1 CAP A MONITORING WELLS
- ⊕ .....PUMPHOUSE # 1 CAP B MONITORING WELLS
- ⊕ .....DAACG MONITORING WELLS
- ═══ .....STORM DRAIN SYSTEM
- --- FLIGHT LINE TRAFFIC CONTROL BARRICADES

NOTES:
1. CONCENTRATION IN ug/L.
2. BLUE VALUES EXCEED IWQSs.
3. RED VALUES EXCEED ACLs.

	IWQS (ug/L)	ACL (ug/L)
Benzene	71.28	285
Toluene	200,000	800,000
Ethylbenzene	28,718	114,800
Xylenes, Total	NONE	NONE

N

0 150 300

SCALE: 1" = 300'

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

FORMER PUMPHOUSE #1 FORMER BUILDING 8060, FACILITY ID:9-025085
SUPPLEMENTAL INVESTIGATION
GROUNDWATER ANALYTICAL RESULTS (FEB 2001)

DRAWN BY:	REV. NO./DATE:	CAD FILE:
J LAMB	0/08/07/01	97028/DGNS/M735085B.DGN

Figure 4. Supplemental Investigation Groundwater Analytical Results for the Former Pumphouse #1 Site, Facility ID #9-025085

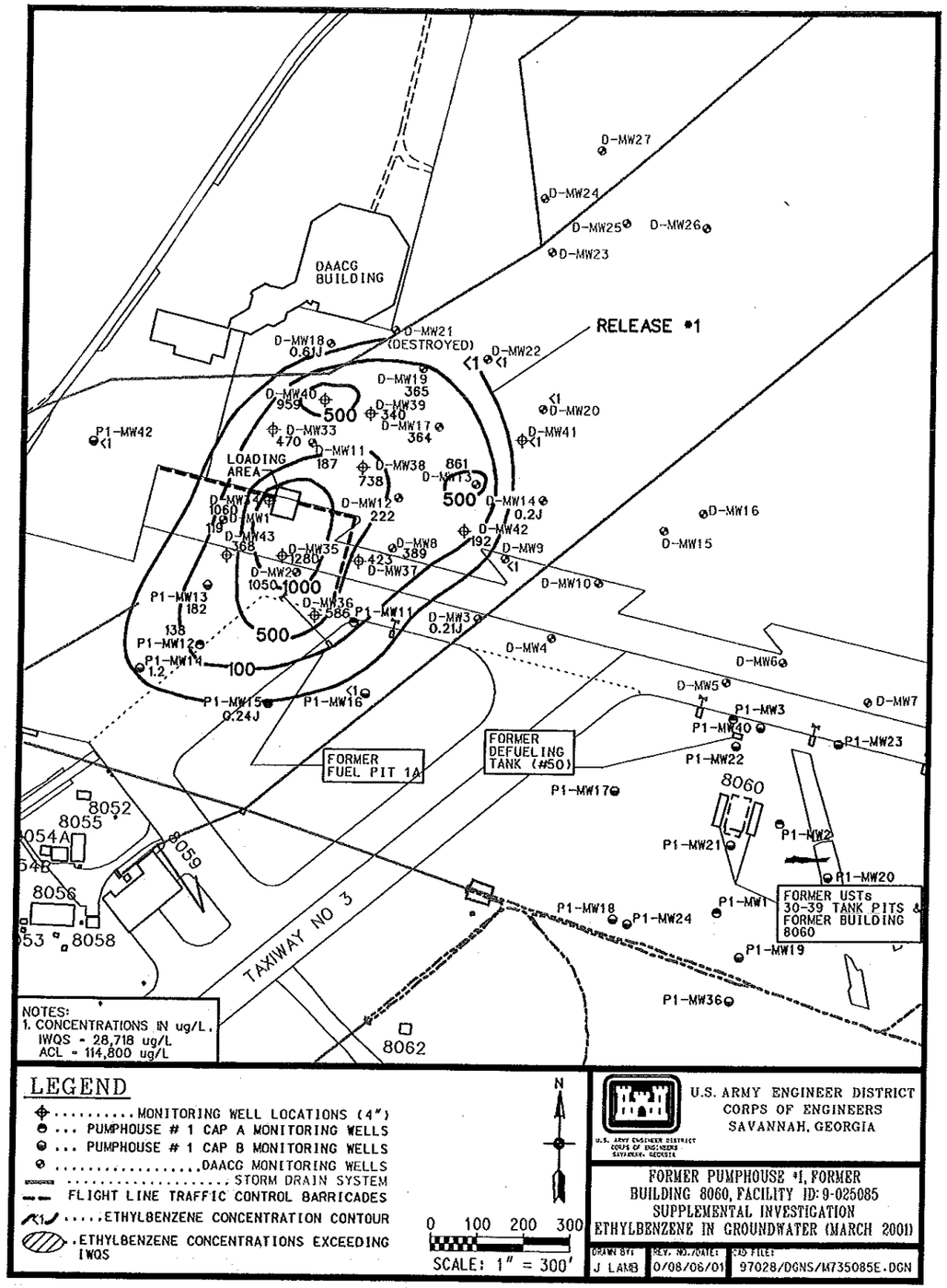


Figure 7. Ethylbenzene Groundwater Quality Map (March 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

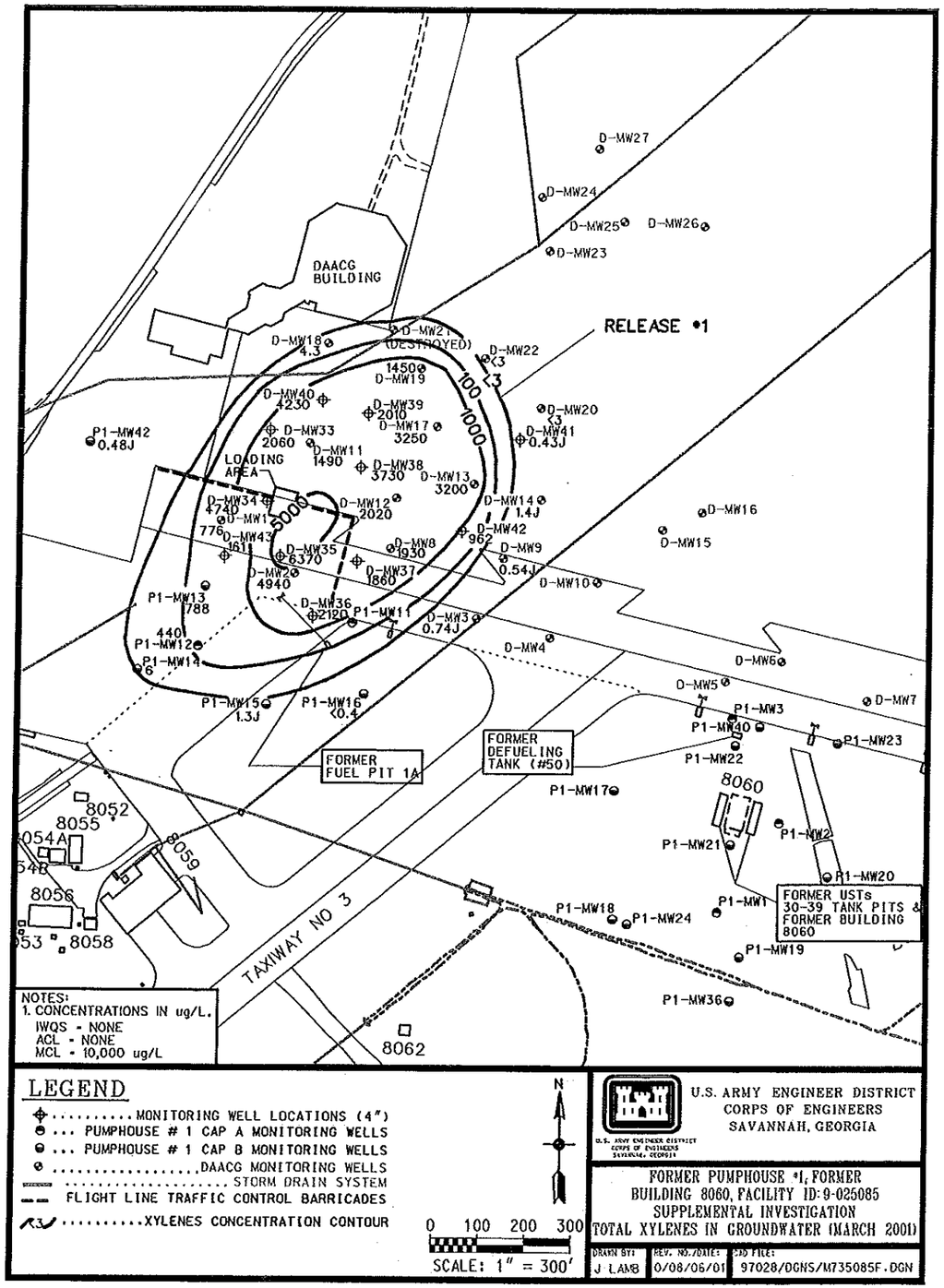


Figure 8. Total Xylenes Groundwater Quality Map (March 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

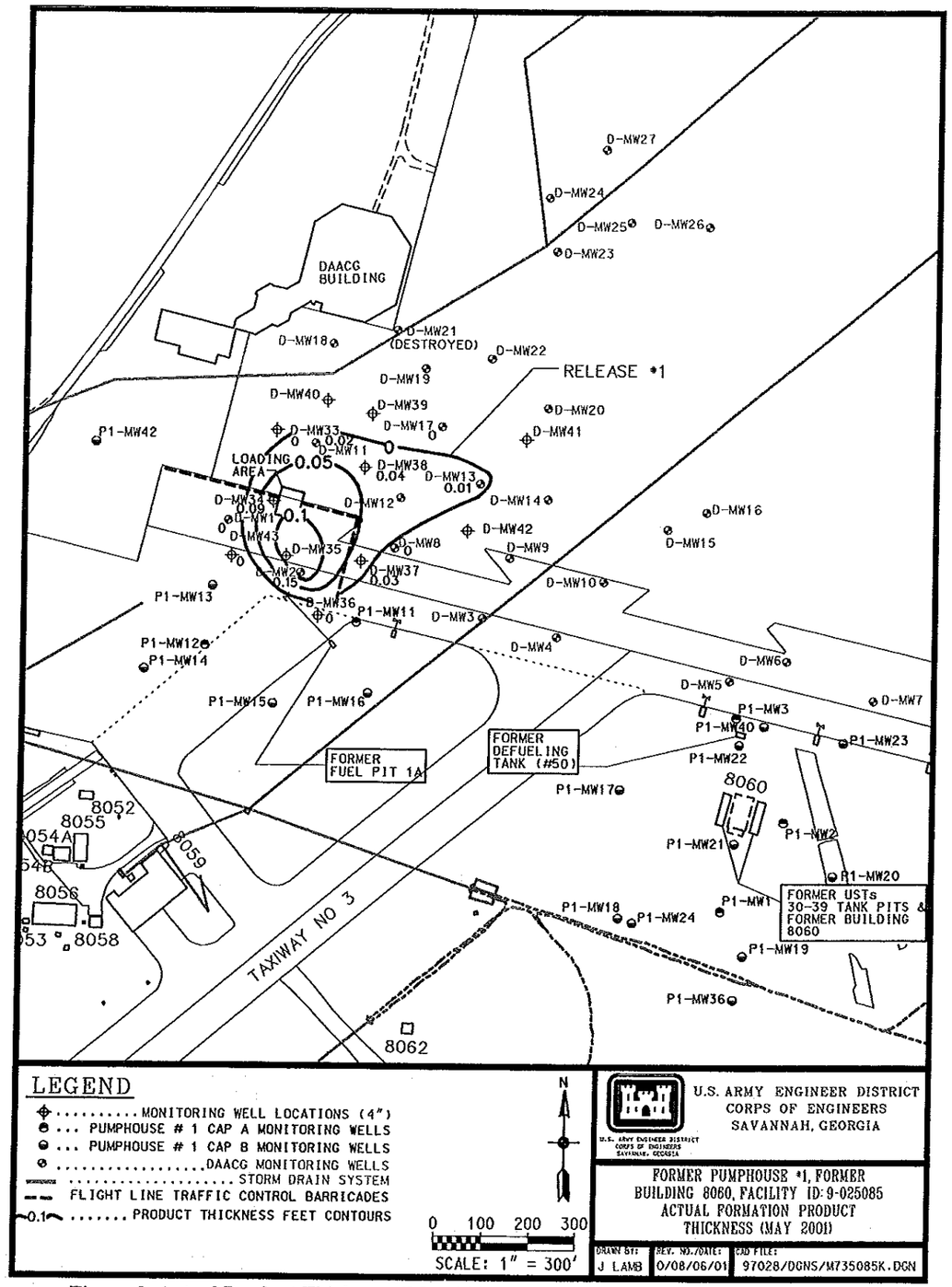


Figure 9. Actual Product Thickness (May 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

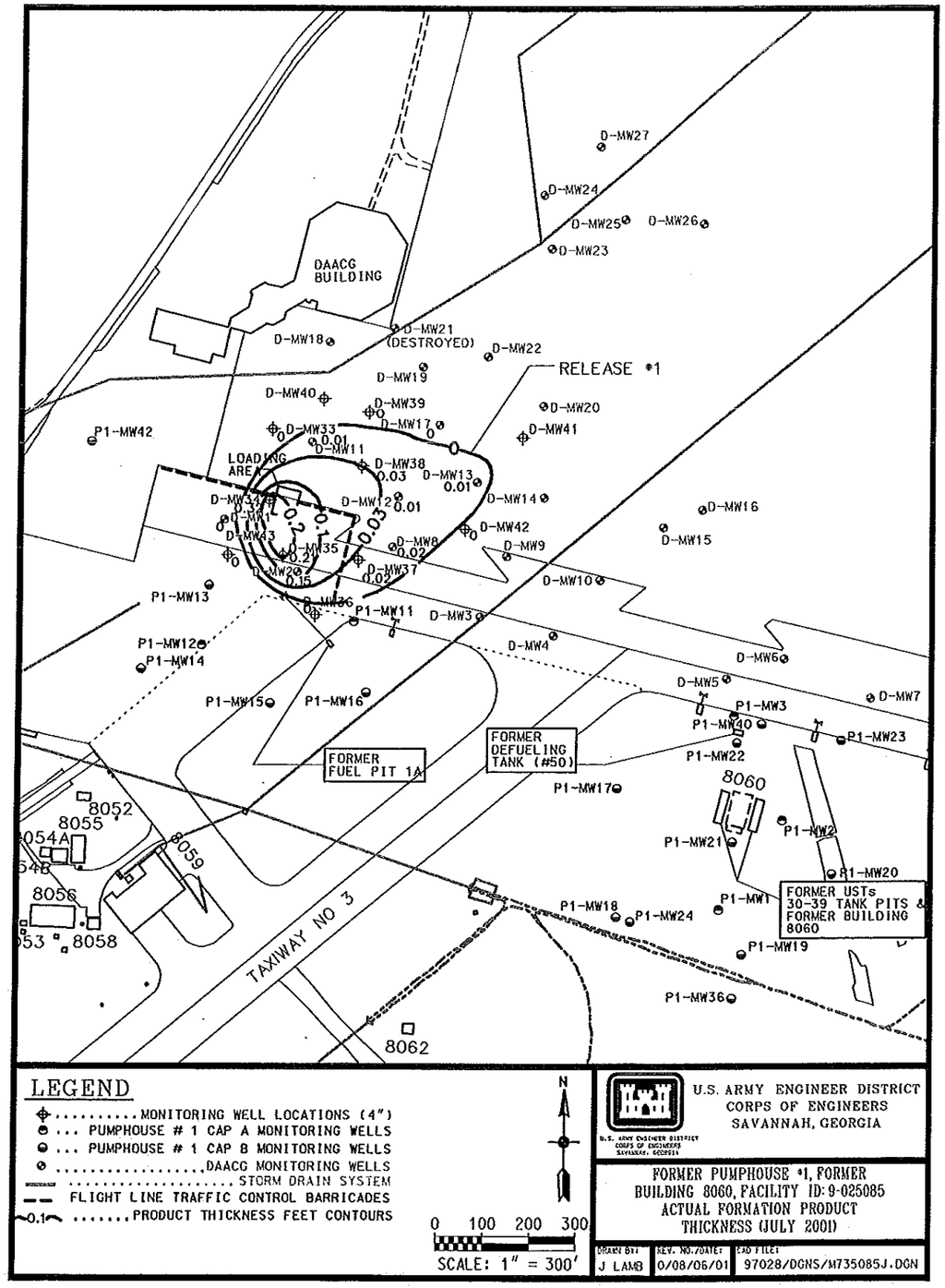


Figure 10. Actual Product Thickness (July 2001) at the Former Pumphouse #1 Site, Facility ID #9-025085

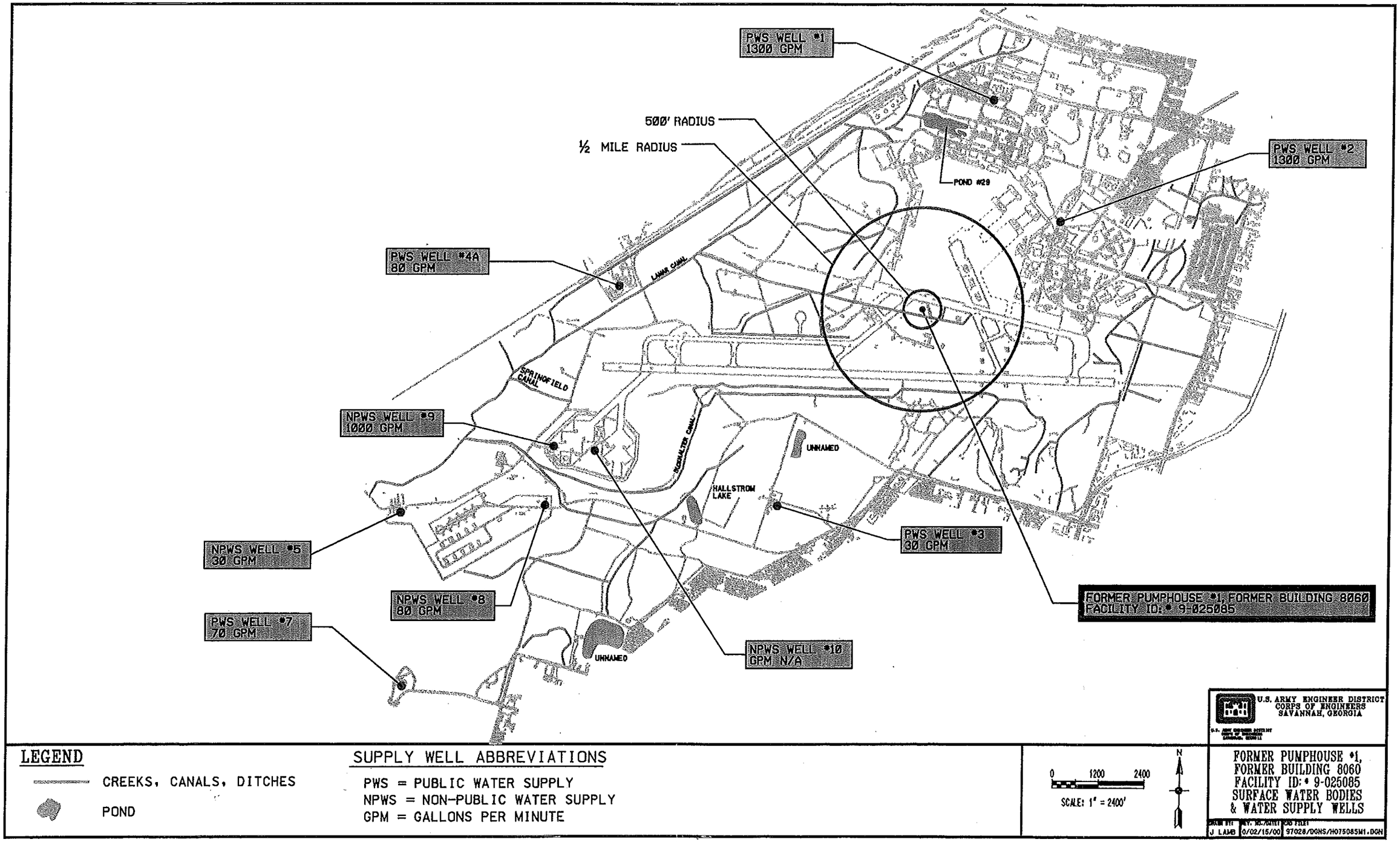
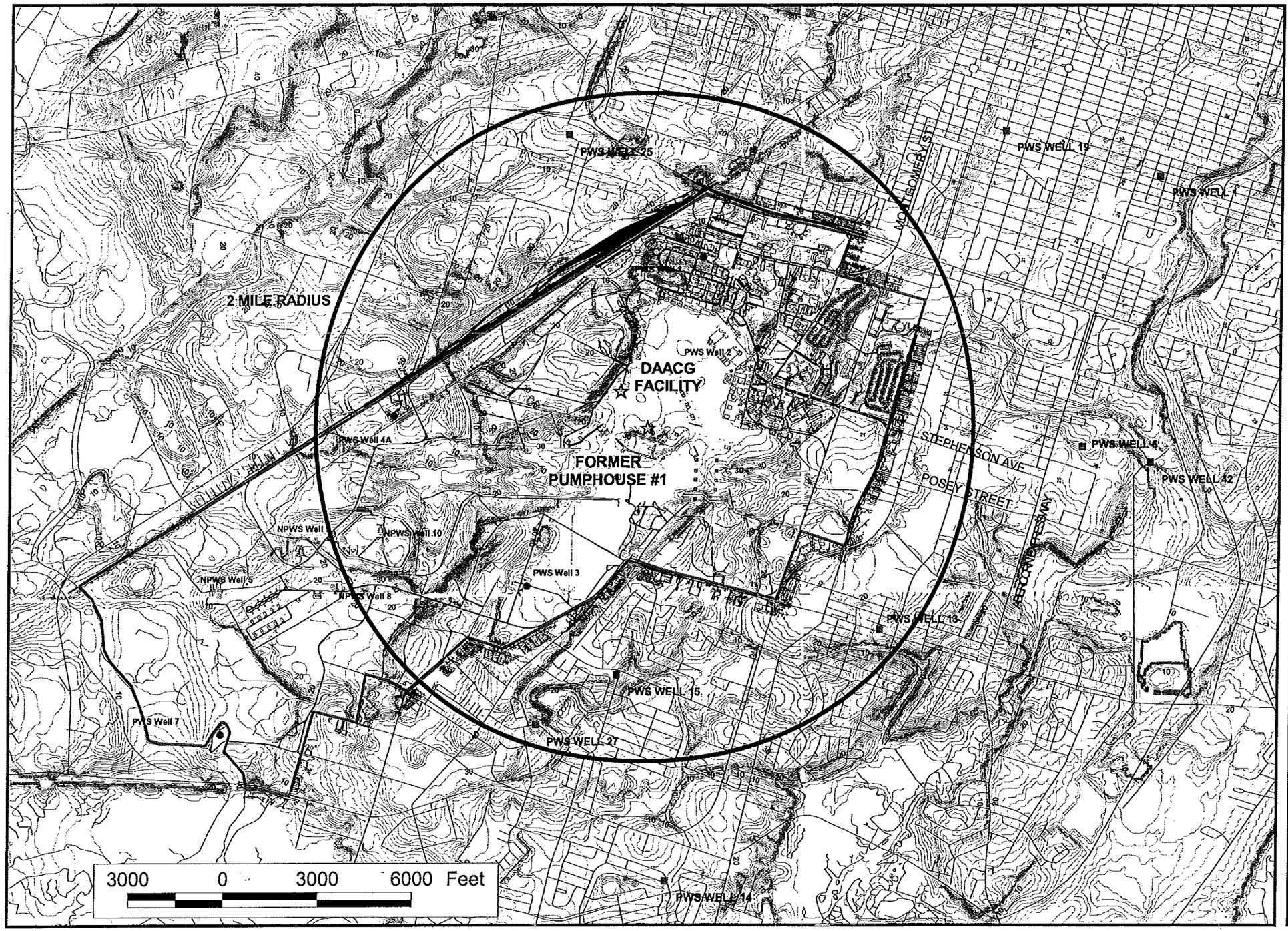


Figure 11. Locations of Public and Non-Public Supply Wells at Hunter Army Airfield and Surrounding Area



Legend:

- Hunter Army Airfield Boundary
- Surface Water (streams/rivers/drains)
- Railroad
- Roads (primary)
- Buildings and,Planimetric Features
- Ground Contour (1 FT Intervals)
- HAAF Non-Public Water Supply Well
- HAAF Public Water Supply Well
- City of Savannah Public Water Supply Well

NOTE:
Contours were created from Digital Elevation Models translated from http://mapping.usgs.gov/, which were obtained from the following U.S.G.S. 7.5 minuteTopographic Quad sheets: Borroughs, Isle of Hope, Savannah, and Garden City. Roads, surface water, and railroad were translated from http://www.gis.state.ga.us/ . Hunter Army Airfield BaseMap received as Microstation files from Fort Stewart.

N

GA State Plane NAD83 (feet)

SAIC
Science Applications International Corporation

FORMER PUMPHOUSE #1,
FORMER BUILDING 8060
FACILITY ID: 9-025085

REVISION	DRAWN BY:	CHKD BY:	DATE:
0	K. Cutshaw	S. Stoller	03/24/00
1	K. Cutshaw	S. Stoller	07/11/00

FILE REFERENCES

051rds_polyline	burroughsctrf
051hyd_polyline	isleofhopectrf
051rr	savannahctrf
hunterarea	gardencityctrf
	trveh.dgn
	bggen.dgn

SHT 1 of 1 — DRAWING #
97028\CI1HUNTERPHI.APR — ARCVIEW PROJECT NAME

Figure 12. Locations of Surface Water Bodies and Water Supply Wells at Hunter Army Airfield

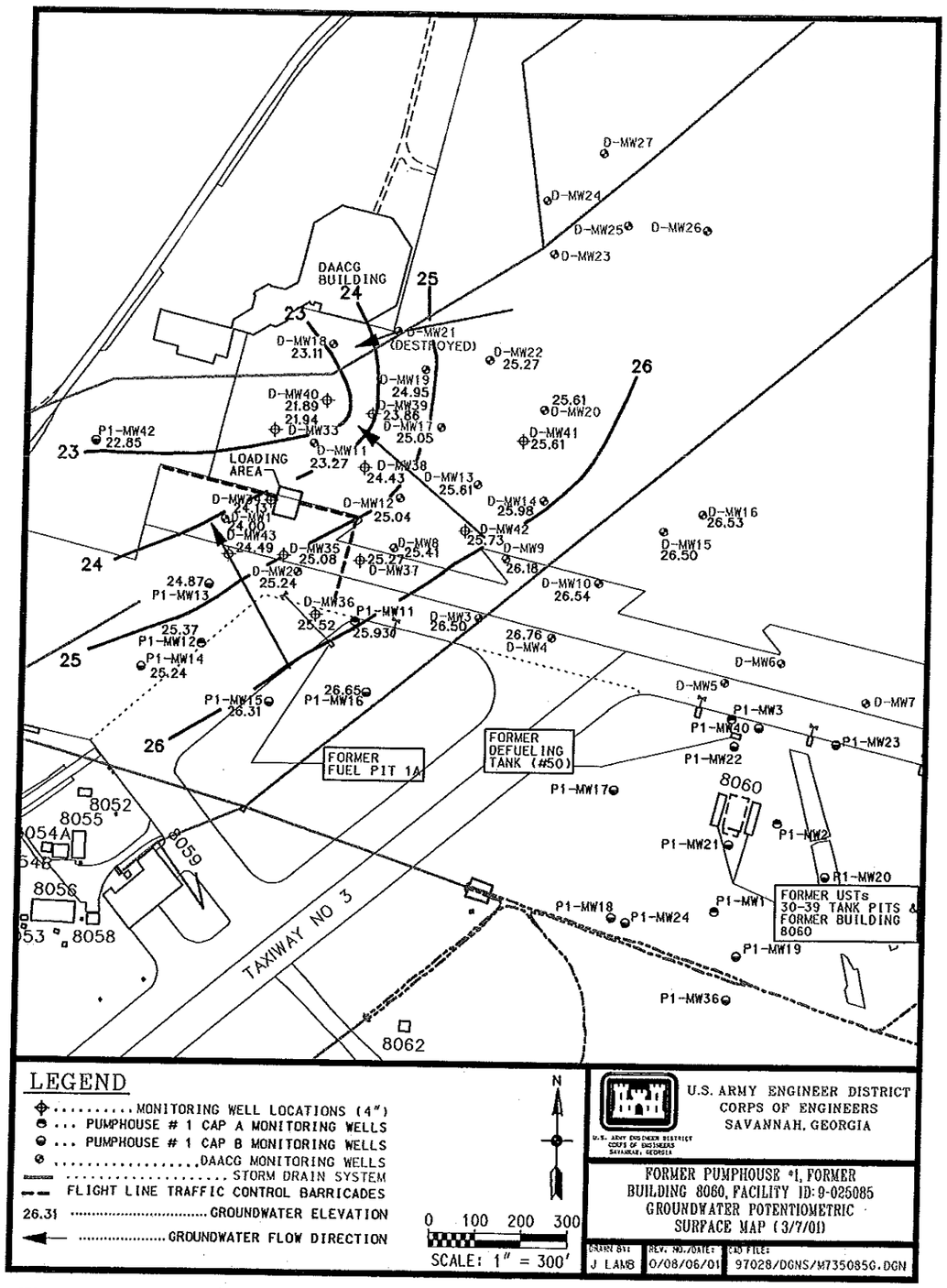


Figure 13. Groundwater Potentiometric Surface Map and Equipotential Flow Net (March 2001) for the Former Pumphouse #1 Site, Facility ID #9-025085

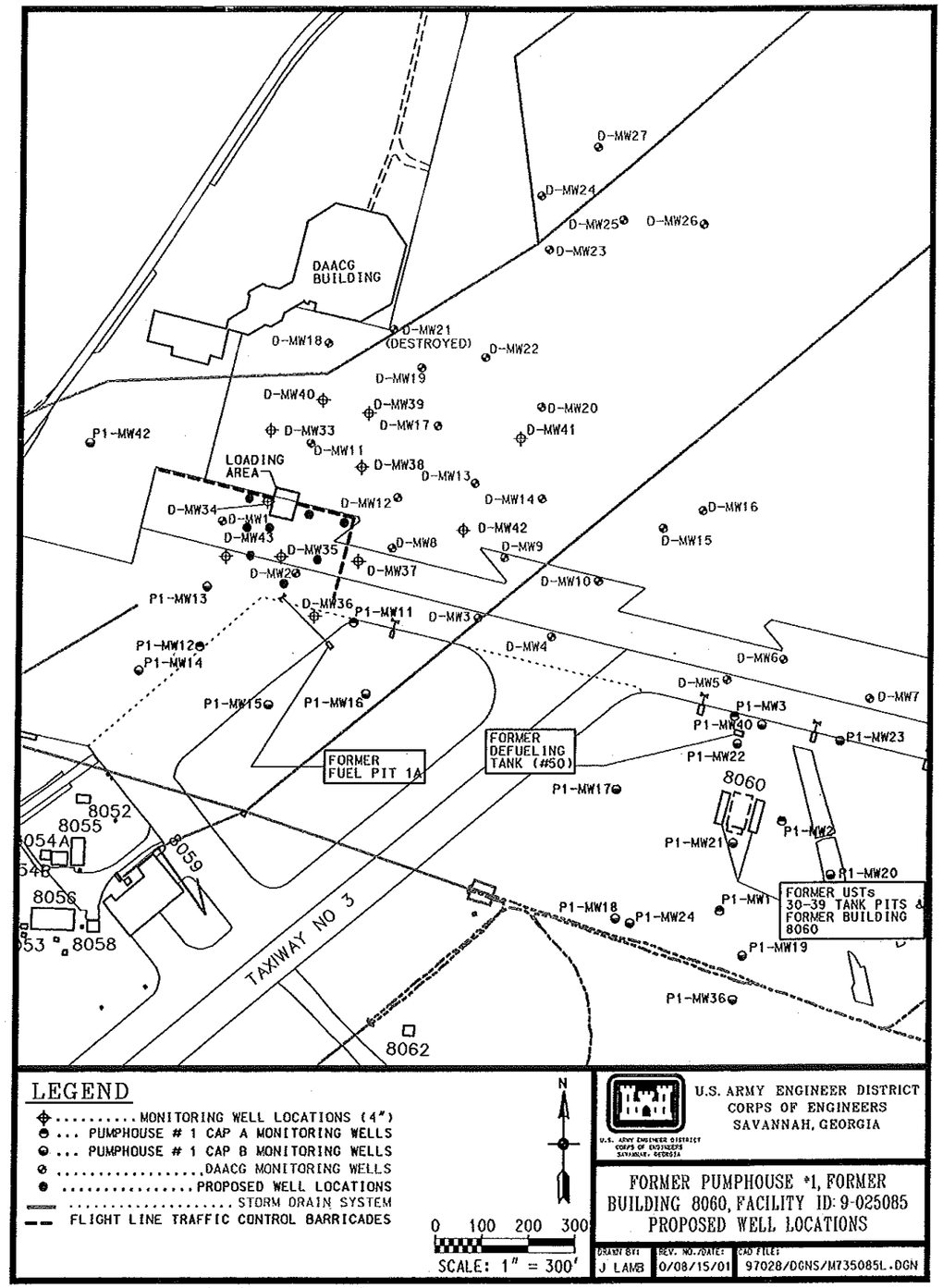


Figure 14. Proposed Well Locations for the Former Pumphouse #1 Site, Facility ID #9-025085

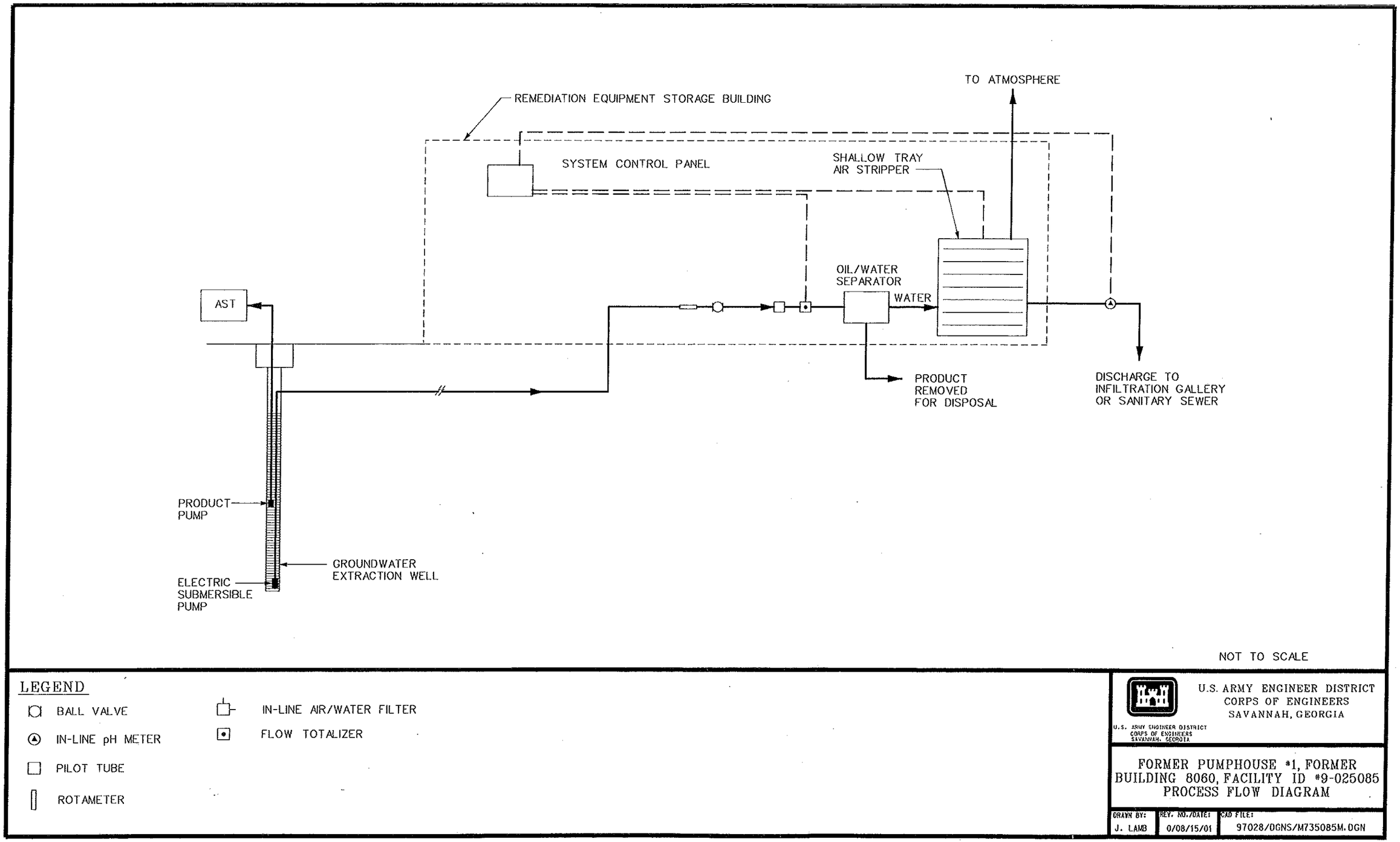
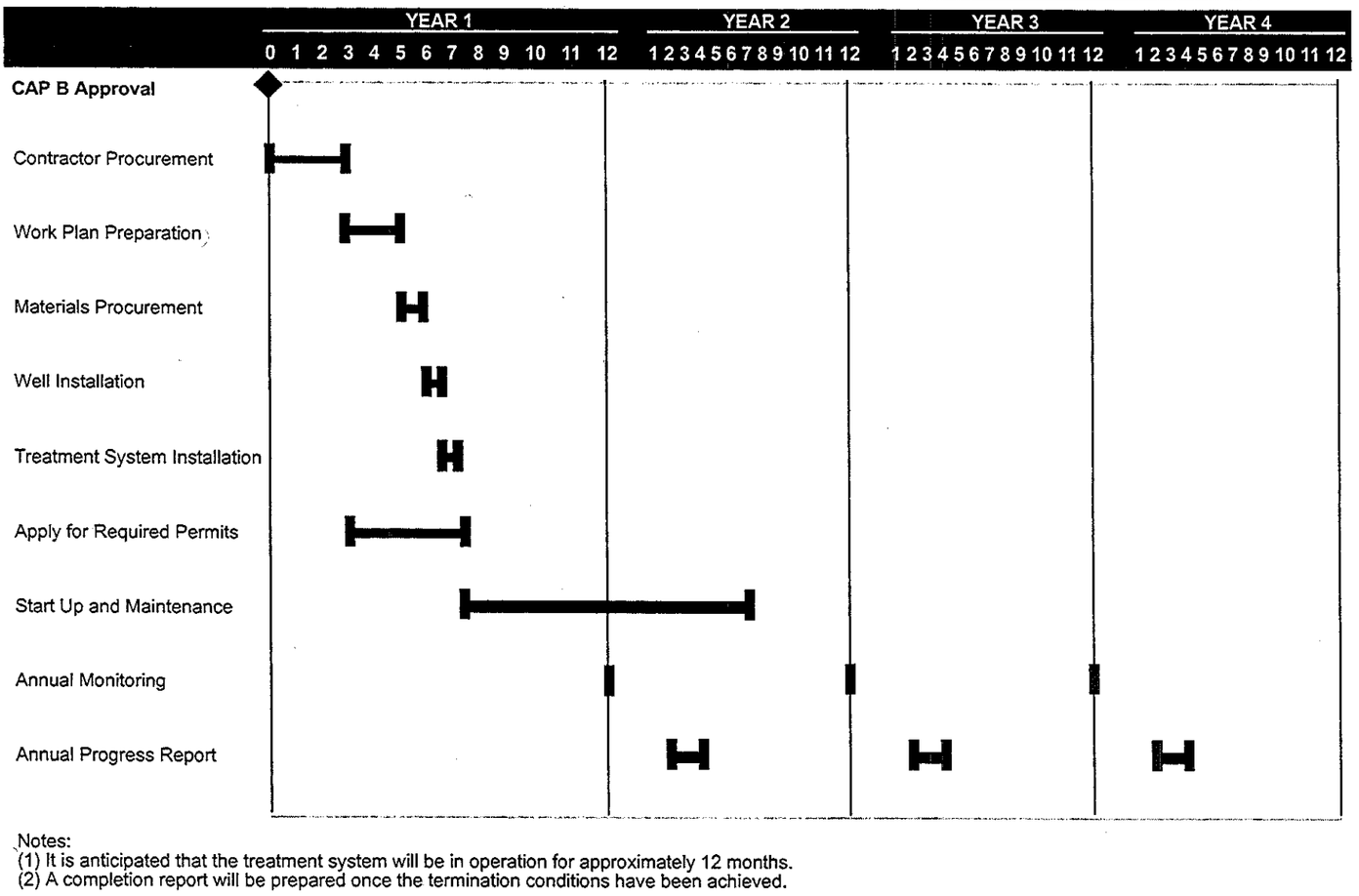


Figure 15. Process Flow Diagram for the Remediation System at the Former Pumphouse #1 Site, Facility ID #9-025085



Notes:
(1) It is anticipated that the treatment system will be in operation for approximately 12 months.
(2) A completion report will be prepared once the termination conditions have been achieved.

Figure 16. Remedial Action Milestone Schedule for the Former Pumphouse #1 Site, Facility ID #9-025085

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APPENDIX II

REPORT TABLES

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Table 1a. Soil Analytical Results
(VOLATILE ORGANIC COMPOUNDS)

Sample Location	Sample ID	Depth (feet BGS)	Date Sampled	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Xylenes (mg/kg)	Total BTEX (mg/kg)
Supplemental CAP–Part B Investigation–2001								
Former Fuel Pit 1A/DAACG (Release #1)								
D-MW33	AK3311	5.0–7.5	02/02/01	**0.269 U**	0.269 U	0.464 =	0.456 =	0.92
D-MW34	AK3411	10.0–12.5	02/03/01	**0.220 U**	5.51 =	4.32 =	17.8 =	27.63
D-MW35	AK3511	11.0–12.5	02/05/01	***11.3 U***	***2550*** =	***355*** =	***1860*** =	4765
D-MW36	AK3611	5.0–7.0	02/03/01	**1.44 J**	74.4 =	16.2 =	80.9 =	172.94
D-MW37	AK3711	10.0–12.0	02/06/01	**1.3 =**	45.6 =	3.87 =	15.7 =	66.47
D-MW38	AK3811	10.0–11.5	02/04/01	**0.131 U**	0.196 U	0.58 =	3.93 =	4.51
D-MW39	AK3911	7.0–11.0	02/02/01	**0.232 U**	0.0949 J	1.24 =	3.08 =	4.4149
D-MW40	AK4011	10.0–12.5	02/02/01	**1.48 U**	0.381 J	0.345 J	13.3 =	14.026
D-MW41	AK4111	10.0–12.5	02/06/01	0.00048 J	0.0024 U	0.0024 U	0.0015 J	0.00198
D-MW42	AK4211	7.0–9.2	02/06/01	0.0025 U	0.0087 =	0.136 J	0.593 =	0.7377
D-MW43	AK4311	7.0–9.2	02/05/01	0.0013 U	0.0013 U	0.0013 U	0.0039 U	ND
GUST Soil Threshold Levels (Table B, Column 1)				0.017	115	18	700	NRC
Alternate Threshold Levels				9.3	479	187	893	—

NOTES:

Bold values exceed STLs.
Italic values exceed ATLs.

BGS Below ground surface.
BTEX Benzene, toluene, ethylbenzene, and xylenes.
CAP Corrective Action Plan.
DAACG Departure/Arrival Air Control Group.
GUST Georgia Underground Storage Tank.
ND Not detected.
NRC No regulatory criteria.

Laboratory Qualifiers

U Indicates that the compound was not detected above the reported sample quantitation limit.
UJ Indicates that the compound was not detected above an approximated sample quantitation limit.
J Indicates that the value for the compound was an estimated value.
= Indicates that the compound was detected at the concentration reported.

Table 1b. Soil Analytical Results
(POLYNUCLEAR AROMATIC HYDROCARBONS)

Sample Location	Sample ID	Depth (feet BGS)	Date Sampled	Detected PAH Compounds (mg/kg)									Total PAHs (mg/kg)
				Acenaphthalene	Anthracene	Benzo(*a*)anthracene	Chrysene	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	
Former Fuel Pit 1A/DAACG (Release #1)													
D-MW33	AK3311	5.0–7.5	02/02/01										ND
D-MW34	AK3411	10.0–12.5	02/03/01									0.0141 J	0.0141
D-MW35	AK3511	11.0–12.5	02/05/01		0.0133 J			0.0688	0.0722	0.828			0.9823
D-MW36	AK3611	5.0–7.0	02/03/01										ND
D-MW37	AK3711	10.0–12.0	02/06/01							0.147			0.147
D-MW38	AK3811	10.0–11.5	02/04/01						0.0188 J				0.0188
D-MW39	AK3911	7.0–11.0	02/02/01					0.0095 J					0.0095
D-MW40	AK4011	10.0–12.5	02/02/01										ND
D-MW41	AK4111	10.0–12.5	02/06/01										ND
D-MW42	AK4211	7.0–9.2	02/06/01	0.0186 J	0.0209 J	0.0256 J	0.0207 J	0.0901	0.0203 J		0.119	0.0675	0.3827
D-MW43	AK4311	7.0–9.2	02/05/01										ND
GUST Soil Threshold Levels (Table B, Column 1)				NRC	NRC	0.66	0.66	NRC	NRC	NRC	NRC	NRC	NRC
Alternate Threshold Levels				—	—	—	2.1	—	—	—	—	—	—

NOTES:

BGS	Below ground surface.
DAACG	Departure/Arrival Air Control Group.
GUST	Georgia Underground Storage Tank.
ND	Not detected; refer to tables in Appendix V for complete list of PAH results.
NRC	No regulatory criteria.
PAH	Polynuclear aromatic hydrocarbon.

Laboratory Qualifiers

U	Indicates that the compound was not detected above the reported sample quantitation limit.
UJ	Indicates that the compound was not detected above an approximated sample quantitation limit.
J	Indicates that the value for the compound was an estimated value.
=	Indicates that the compound was detected at the concentration reported.

Table 2. Groundwater Analytical Results
(VOLATILE ORGANIC COMPOUNDS)

Sample Location	Sample ID	Screened Interval (feet BGS)	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total BTEX (µg/L)
Supplemental CAP–Part B Investigation, 2001								
Former Fuel Pit 1A/DAACG (Release #1)								
D-MW01	AK0122	7.0–17.0	03/10/01	**99.8** =	17.3 =	119 =	776 =	1,012.1
D-MW02	AK0222	7.6–17.6	03/11/01	***400*** =	11,200 =	1,050 =	4,940 =	17,590
D-MW03	AK0322	6.0–16.0	03/11/01	1 U	1 U	0.21 J	0.74 J	0.95
D-MW08	AK0822	7.0–17.0	03/11/01	**156** =	31.4 =	389 =	1,930 =	2,506.4
D-MW09	AK0922	6.0–16.0	03/09/01	1 U	1 U	1 U	0.54 J	0.54
D-MW11	AK1122	6.6–16.6	03/10/01	**179** =	398 =	187 =	1,490 =	2,254
D-MW12	AK1222	5.6–15.6	03/11/01	58.1 =	123 =	222 =	2,020 =	2,423.1
D-MW13	AK1322	5.0–15.0	03/09/01	25.0 U	36.2 U	861 =	3,200 =	4,061
D-MW14	AK1422	5.0–15.0	03/09/01	1 U	1 U	0.2 J	1.4 J	1.6
D-MW17	AK1722	6.5–16.5	03/11/01	**159** =	3,550 =	364 =	3,250 =	7,323
D-MW18	AK1822	6.6–16.6	03/10/01	0.32 J	1.4 =	0.61 J	4.3 =	6.63
D-MW19	AK1922	6.0–16.0	03/09/01	64.2 =	1,510 =	365 =	1,450 =	3,389.2
D-MW20	AK2022	7.0–17.0	03/09/01	1 U	1 U	1 U	3 U	ND
D-MW22	AK2222	6.0–16.0	03/09/01	1 U	0.33 J	1 U	3 U	0.33
D-MW33	AK3322	9.0–19.0	03/09/01	**77.9** =	774 =	470 =	2,060 =	3,381.9
D-MW34	AK3422	7.0–17.0	03/11/01	***388*** =	8,180 =	1,060 =	4,740 =	14,368
D-MW35	AK3522	7.0–17.0	03/11/01	***765*** =	29,600 =	1,280 =	6,370 =	38,015
D-MW36	AK3622	7.0–17.0	03/09/01	**197** =	2,050 =	586 =	2,120 =	4,953
D-MW37	AK3722	7.0–17.0	03/10/01	***601*** =	5,340 =	423 =	1,860 =	8,224
D-MW38	AK3822	7.0–17.0	03/09/01	**123** =	2,410 =	738 =	3,730 =	7,001
D-MW39	AK3922	7.0–17.0	03/09/01	29.7 =	98.4 =	340 =	2,010 =	2,478.1
D-MW40	AK4022	8.0–18.0	03/09/01	***313*** =	75.3 =	959 =	4,230 =	5,577.3
D-MW41	AK4122	7.0–17.0	03/09/01	1 U	1 U	1 U	0.43 J	0.43
D-MW42	AK4222	7.0–17.0	03/09/01	1 U	112 =	192 =	962 =	1,266
D-MW43	AK4322	7.0–17.0	03/09/01	10 =	157 =	36.8 =	161 =	364.8
P1-MW12	AN1222	6.5–16.5	03/11/01	1.7 =	2.1 =	138 =	440 =	581.8
P1-MW13	AN1322	7.0–17.0	03/09/01	19.5 =	493 =	182 =	788 =	1,482.5
P1-MW14	AN1422	7.0–17.0	03/10/01	0.2 J	1.5 =	1.2 =	6 =	8.9
P1-MW15	AN1522	6.0–16.0	03/10/01	1 U	0.29 J	0.24 J	1.3 J	1.83
P1-MW16	AN1622	6.0–16.0	03/10/01	1 U	0.27 J	1 U	0.4 U	0.67
P1-MW42	AN4222	5.6–15.6	03/09/01	1 U	1 U	1 U	0.48 J	0.48
In-Stream Water Quality Standards (GA Chapter 391-3-6)				71.28	200,000	28,718	NRC	NRC
Alternate Concentration Limits				285	800,000	114,800	—	—

NOTES:

Bold values exceed IWQSs.

Italic values exceed ACLs.

BGS Below ground surface.
BTEX Benzene, toluene, ethylbenzene, and xylenes.
CAP Corrective Action Plan.
DAACG Departure/Arrival Air Control Group.
ND Not detected.
NRC No regulatory criteria.

Laboratory Qualifiers

U Indicates that the compound was not detected above the reported sample quantitation limit.
UJ Indicates that the compound was not detected above an approximated sample quantitation limit.
J Indicates that the value for the compound was an estimated value.
= Indicates that the compound was detected at the concentration reported.

Table 3. Groundwater Elevations

Well Number	Date Measured	Top of Casing Elevation (feet MSL)	Screened Interval (feet BGS)	Depth of Free Product (feet BTOC)	Water Depth (feet BTOC)	Product Thickness (feet)	Corrected Groundwater Elevation (feet MSL)
Absorbent Sock Replacement – May 2000							
D-MW1	05/24/00	36.28	7.0–17.0	—	11.74	0[a]	24.54
D-MW2	05/25/00	36.90	7.6–17.6	11.24	11.61	0.37[b]	25.61[c]
D-MW8	05/24/00	36.58	7.0–17.0	—	10.78	sheen[b]	25.80
D-MW11	05/24/00	34.10	6.0–16.0	10.53	10.54	0.01[b]	23.57[c]
D-MW12	05/24/00	35.87	5.6–15.6	—	10.55	0[a]	25.32
D-MW13	05/24/00	36.17	5.0–15.0	—	10.31	sheen[b]	25.86
D-MW17	05/24/00	35.35	6.5–16.5	—	10.14	sheen[b]	25.21
Absorbent Sock Replacement – July 2000							
D-MW1	07/24/00	36.28	7.0–17.0	—	12.25	0[a]	24.03
D-MW2	07/25/00	36.90	7.6–17.6	11.45	13.01	1.56[b]	25.26[c]
D-MW3	07/24/00	36.97	6.0–16.0	—	10.75	0[a]	26.22
D-MW8	07/24/00	36.58	7.0–17.0	—	11.28	sheen[b]	25.30
D-MW9	07/24/00	36.21	6.0–16.0	—	10.15	0[a]	26.06
D-MW11	07/24/00	34.10	6.0–16.0	—	10.85	sheen[b]	23.25
D-MW12	07/24/00	35.87	5.6–15.6	—	10.95	0[a]	24.92
D-MW13	07/24/00	36.17	5.0–15.0	—	10.64	sheen[b]	25.53
P1-MW13	07/25/00	35.85	7.0–17.0		10.99	0[a]	24.86
Absorbent Sock Replacement – September 2000							
D-MW1	09/27/00	36.28	7.0–17.0	—	11.67	0[a]	24.61
D-MW2	09/27/00	36.90	7.6–17.6	11.05	11.16	0.11[b]	25.84[c]
D-MW8	09/27/00	36.58	7.0–17.0	—	10.61	sheen[b]	25.97
D-MW11	09/27/00	34.10	6.0–16.0	—	10.53	sheen[b]	23.57
D-MW12	09/27/00	35.87	5.6–15.6	—	10.51	0[a]	25.36
D-MW13	09/27/00	36.17	5.0–15.0	—	10.42	sheen[b]	25.75
D-MW17	09/27/00	35.35	6.5–16.5	—	10.26	sheen[b]	25.09
P1-MW11	09/27/00	36.42	7.0–17.0	—	9.40	sheen[b]	27.02
Absorbent Sock Replacement – December 2000							
D-MW2	12/01/00	36.90	7.6–17.6	11.54	13.24	1.70[b]	25.16[c]
D-MW8	12/01/00	36.58	7.0–17.0	—	11.37	0[d]	25.21
D-MW11	12/01/00	34.10	6.0–16.0	—	10.92	0[d]	23.18
D-MW12	12/01/00	35.87	5.6–15.6	—	11.01	0[a]	24.86
D-MW13	12/01/00	36.17	5.0–15.0	—	10.72	0[d]	25.45
D-MW17	12/01/00	35.35	6.5–16.5	—	10.50	0[d]	24.85
P1-MW11	12/01/00	36.42	7.0–17.0	—	10.81	0[d]	25.61

NOTES:
[a] No absorbent sock was located in the well.
[b] The absorbent sock in the well was removed and replaced.
[c] The groundwater elevation was corrected using a density of 880 kg/m^3 for the product.
[d] The absorbent sock in the well was removed, but not replaced.
[e] An absorbent sock was placed in the well.
BTOC Below top of casing.
MSL Mean sea level.

Table 3. Groundwater Elevations (continued)

Well Number	Date Measured	Top of Casing Elevation (feet MSL)	Screened Interval (feet BGS)	Depth of Free Product (feet BTOC)	Water Depth (feet BTOC)	Product Thickness (feet)	Corrected Groundwater Elevation. (feet MSL)
Absorbent Sock Replacement – February 2001							
D-MW1	02/07/01	36.28	7.0–17.0	—	12.12	0[a]	24.16
D-MW2	02/07/01	36.90	7.6–17.6	11.46[b]	12.39	0.93[b]	25.33[c]
D-MW8	02/07/01	36.58	7.0–17.0	—	11.10	0[a]	25.48
D-MW11	02/07/01	34.10	6.0–16.0	—	10.73	0[a]	23.37
D-MW12	02/07/01	35.87	5.6–15.6	—	10.78	sheen[a]	25.09
D-MW13	02/07/01	36.17	5.0–15.0	—	10.56	0[a]	25.61
D-MW17	02/07/01	35.35	6.5–16.5	—	10.25	sheen[a]	25.10
P1-MW11	02/07/01	36.42	7.0–17.0	—	10.36	sheen[a]	26.06
Supplemental CAP–Part B Investigation- 2001							
D-MW1	03/07/01	36.28	7.0–17.0	—	12.28	0[a]	24.00
D-MW2	03/07/01	36.90	7.6–17.6	11.51	12.77	1.26[b]	25.24[c]
D-MW3	03/07/01	36.97	6.0–16.0	—	10.47	0[a]	26.50
D-MW4	03/07/01	37.31	7.0–17.0	—	10.55	0[a]	26.76
D-MW8	03/07/01	36.58	7.0–17.0	—	11.17	0[a]	25.41
D-MW9	03/07/01	36.21	6.0–16.0	—	10.03	0[a]	26.18
D-MW10	03/07/01	36.59	6.0–16.0	—	10.05	0[a]	26.54
D-MW11	03/07/01	34.10	6.0–16.0	—	10.83	0[a]	23.27
D-MW12	03/07/01	35.87	5.6–15.6	—	10.83	0[a]	25.04
D-MW13	03/07/01	36.17	5.0–15.0	—	10.56	0[a]	25.61
D-MW14	03/07/01	35.03	5.0–15.0	—	9.05	0[a]	25.98
D-MW15	03/07/01	35.18	4.7–14.7	—	8.68	0[a]	26.50
D-MW16	03/07/01	35.48	4.9–14.9	—	8.95	0[a]	26.53
D-MW17	03/07/01	35.35	6.5–16.5	—	10.30	0[a]	25.05
D-MW18	03/07/01	34.82	6.6–16.6	—	11.71	0[a]	23.11
D-MW19	03/07/01	34.94	6.0–16.0	—	9.99	0[a]	24.95
D-MW20	03/07/01	36.25	7.0–17.0	—	10.64	0[a]	25.61
D-MW22	03/07/01	34.88	6.0–16.0	—	9.61	0[a]	25.27
D-MW33	03/07/01	33.48	9.0–19.0	—	11.54	0[a]	21.94
D-MW34	03/07/01	35.55	7.0–17.0	11.24	12.71	1.47[e]	24.13[c]
D-MW35	03/07/01	36.46	7.0–17.0	11.19	12.81	1.62[e]	25.08[c]
D-MW36	03/07/01	36.24	7.0–17.0	—	10.72	0[a]	25.52
D-MW37	03/07/01	36.83	7.0–17.0	—	11.56	0[a]	25.27
D-MW38	03/07/01	34.89	7.0–17.0	10.46	10.50	0.04[e]	24.43[c]
D-MW39	03/07/01	33.73	7.0–17.0	—	9.87	0[a]	23.86
D-MW40	03/07/01	33.43	8.0–18.0	—	11.54	0[a]	21.89
D-MW41	03/07/01	36.12	7.0–17.0	—	10.51	0[a]	25.61
D-MW42	03/07/01	35.87	7.0–17.0	—	10.14	0[a]	25.73
D-MW43	03/07/01	36.42	7.0–17.0	—	11.93	0[a]	24.49

NOTES:
[a] No absorbent sock was located in the well.
[b] The absorbent sock in the well was removed and replaced.
[c] The groundwater elevation was corrected using a density of 880 kg/m^3 for the product.
[d] The absorbent sock in the well was removed, but not replaced.
[e] An absorbent sock was placed in the well.
BTOC Below top of casing.
MSL Mean sea level.

Table 3. Groundwater Elevations (continued)

Well Number	Date Measured	Top of Casing Elevation (feet MSL)	Screened Interval (feet BGS)	Depth of Free Product (feet BTOC)	Water Depth (feet BTOC)	Product Thickness (feet)	Corrected Groundwater Elevation. (feet MSL)
P1-MW11	03/07/01	36.42	7.0–17.0	—	10.49	0[a]	25.93
P1-MW12	03/07/01	35.14	6.5–16.5	—	9.77	0[a]	25.37
P1-MW13	03/07/01	35.85	7.0–17.0	—	10.98	0[a]	24.87
P1-MW14	03/07/01	34.78	7.0–17.0	—	9.54	0[a]	25.24
P1-MW15	03/07/01	35.24	6.0–16.0	—	8.93	0[a]	26.31
P1-MW16	03/07/01	34.77	6.0–16.0	—	8.12	0[a]	26.65
P1-MW42	03/07/01	34.29	5.6–15.6	—	11.44	0[a]	22.85
Absorbent Sock Replacement – May 2001							
D-MW1	05/03/01	36.28	7.0–17.0	—	11.9	0[a]	24.38
D-MW2	05/03/01	36.90	7.6–17.6	11.28	11.98	0.7[e]	25.54[c]
D-MW8	05/03/01	36.58	7.0–17.0	—	10.85	0[a]	25.73
D-MW11	05/03/01	34.10	6.0–16.0	10.6	10.62	0.02[c]	23.50[c]
D-MW12	05/03/01	35.87	5.6–15.6	—	10.56	0[a]	25.31
D-MW13	05/03/01	36.17	5.0–15.0	10.3	10.31	0.01[e]	25.87[c]
D-MW17	05/03/01	35.35	6.5–16.5	—	10.11	0[a]	25.24
D-MW33	05/03/01	33.48	9.0–19.0	—	11.36	0[a]	22.12
D-MW34	05/03/01	35.55	7.0–17.0	10.88	12.39	1.51[e]	24.49[c]
D-MW35	05/03/01	36.46	7.0–17.0	10.99	11.88	0.89[e]	25.36[c]
D-MW36	05/03/01	36.24	7.0–17.0	—	10.29	0[a]	25.95
D-MW37	05/03/01	36.83	7.0–17.0	11.21	11.24	0.03[e]	25.62[c]
D-MW38	05/03/01	34.89	7.0–17.0	10.21	10.25	0.04[e]	24.68[c]
D-MW39	05/03/01	33.73	7.0–17.0	—	9.71	0[a]	24.02
D-MW43	05/03/01	36.42	7.0–17.0	—	11.5	0[a]	24.92
P1-MW11	05/03/01	36.42	7.0–17.0	—	10.07	0[a]	26.35
Absorbent Sock Replacement – July 2001							
D-MW2	07/10/01	36.90	7.6–17.6	11.42	12.11	0.69[b]	25.40[c]
D-MW8	07/10/01	36.58	7.0–17.0	11.00	11.04	0.04[e]	25.58[c]
D-MW11	07/10/01	34.10	6.0–16.0	—	10.8	0[b]	23.30
D-MW12	07/10/01	35.87	5.6–15.6	—	10.8	sheen[e]	25.07
D-MW13	07/10/01	36.17	5.0–15.0	—	10.55	0[b]	25.62
D-MW33	07/10/01	33.48	9.0–19.0	—	11.50	0[a]	21.98
D-MW34	07/10/01	35.55	7.0–17.0	11.03	12.75	1.72[b]	24.31[c]
D-MW35	07/10/01	36.46	7.0–17.0	11.12	12.16	1.04[b]	25.21[c]
D-MW36	07/10/01	36.24	7.0–17.0	—	10.37	0[a]	25.87
D-MW37	07/10/01	36.83	7.0–17.0	—	11.38	0[b]	25.45
D-MW38	07/10/01	34.89	7.0–17.0	10.41	10.54	0.13[b]	24.46[c]
D-MW43	07/10/01	36.42	7.0–17.0	—	11.68	0[a]	24.74

NOTES:

[a] No absorbent sock was located in the well.

[b] The absorbent sock in the well was removed and replaced.

[c] The groundwater elevation was corrected using a density of 880 kg/m^3 for the product.

[d] The absorbent sock in the well was removed, but not replaced.

[e] An absorbent sock was placed in the well.

BTOC Below top of casing.

MSL Mean sea level.

Table 3. Groundwater Elevations (continued)

Well Number	Date Measured	Top of Casing Elevation (feet MSL)	Screened Interval (feet BGS)	Depth of Free Product (feet BTOC)	Water Depth (feet BTOC)	Product Thickness (feet)	Corrected Groundwater Elevation. (feet MSL)
Field Bailout Tests –July 2001							
D-MW1	07/26/01	36.28	7.0–17.0	—	12.25	0[a]	24.03
D-MW2	07/26/01	36.90	7.6–17.6	11.56	12.58	1.02[b]	25.22[c]
D-MW8	07/26/01	36.58	7.0–17.0	11.23	11.25	0.02[b]	25.35[c]
D-MW11	07/26/01	34.10	6.0–16.0	11.51	11.52	0.01[b]	22.59[c]
D-MW12	07/26/01	35.87	5.6–15.6	10.94	10.95	0.01[b]	24.93[c]
D-MW13	07/26/01	36.17	5.0–15.0	10.67	10.68	0.01[b]	25.50[c]
D-MW17	07/26/01	35.35	6.5–16.5	—	10.49	0[a]	24.86
D-MW33	07/26/01	33.48	9.0–19.0	—	11.59	0[a]	21.89
D-MW34	07/26/01	35.55	7.0–17.0	11.14	13.03	1.89[b]	24.18[c]
D-MW35	07/26/01	36.46	7.0–17.0	11.21	12.70	1.49[b]	25.07[c]
D-MW36	07/26/01	36.24	7.0–17.0	—	10.69	0[a]	25.55
D-MW37	07/26/01	36.83	7.0–17.0	11.63	11.65	0.02[b]	25.20[c]
D-MW38	07/26/01	34.89	7.0–17.0	10.59	10.62	0.03[b]	24.30[c]
D-MW39	07/26/01	33.73	7.0–17.0	—	10.03	0[a]	23.70
D-MW42	07/26/01	35.87	7.0–17.0	—	10.21	0[a]	25.66
D-MW43	07/26/01	36.42	7.0–17.0	—	11.88	0[a]	24.54

NOTES:

[a] No absorbent sock was located in the well.

[b] The absorbent sock in the well was removed and replaced.

[c] The groundwater elevation was corrected using a density of 880 kg/m^3 for the product.

[d] The absorbent sock in the well was removed, but not replaced.

[e] An absorbent sock was placed in the well.

BTOC Below top of casing.

MSL Mean sea level.

Table 4. Supplemental Investigation (February 2001) – Geotechnical Results

Boring Location		**D-MW37**	**D-MW39**
Sample ID		**AK3731**	**AK3931**
Sample Depth (feet BGS)			
Sample Date		**02/06/01**	**02/02/01**
Moisture Content (%)		27	NA
Atterberg Limits (LL/PL)		74/28	NA
Specific Gravity		2.38	NA
Hydraulic Conductivity (cm/sec)		9.86×10^{-9}	NA
Porosity		0.38	NA
Sieve Analysis – Percent Passing	3/8"	100	100
	No. 4	100	100
	No. 10	99.7	100
	No. 20	99.2	99.9
	No. 40	98.6	99.8
	No. 60	96.9	99.1
	No. 100	90.3	93.9
	No. 200	88.8	91.9

NOTES:
BGS Below ground surface.
LL Liquid limit.
NA Not analyzed.
NP Non-plastic.
PL Plastic limit.

Table 5. Well Construction Details

Boring/Well Number	Date Installed	Boring Depth (feet BGS)	Screened Interval (feet BGS)	Type of Completion	Coordinates (NAD83)[a]		Elevation (NGVD88)	
					Northing	Easting	Ground Surface	Top of Casing
CAP–Part A Investigation – 1996								
P1-MW11	11/21/96	18.0	7.0–17.0	2" PVC	734649.15	973338.76	36.60	36.42
P1-MW12	11/21/96	18.0	6.5–16.5	2" PVC	734599.32	973011.39	35.34	35.14
CAP–Part B Investigation – 1997, 1999								
P1-MW13	05/12/97	18.0	7.0–17.0	2" PVC	734726.70	973026.74	36.15	35.85
P1-MW14	05/12/97	18.0	7.0–17.0	2" PVC	734548.76	972881.25	34.95	34.78
P1-MW15	05/12/97	17.0	6.0–16.0	2" PVC	734475.11	973160.31	35.48	35.24
P1-MW16	05/12/97	17.0	6.0–16.0	2" PVC	734497.89	973365.89	34.89	34.77
P1-MW42	09/27/99	18.0	5.6–15.6	2" PVC	735032.45	972772.82	34.56	34.29
DAACG Facility Investigation Wells								
D-MW1	04/23/96	17.4	7.0–17.0	2" PVC	734865.68	973058.72	36.39	36.28
D-MW2	04/23/96	18.0	7.6–17.6	2" PVC	734754.28	973216.83	37.05	36.90
D-MW3	04/24/96	16.5	6.0–16.0	2" PVC	734659.31	973605.33	37.21	36.97
D-MW4	04/24/96	16.0	7.0–17.0	2" PVC	734618.70	973763.86	37.46	37.31
D-MW8	04/24/96	17.5	7.0–17.0	2" PVC	734807.62	973419.79	36.80	36.58
D-MW9	04/24/96	16.5	6.0–16.0	2" PVC	734787.14	973661.55	36.38	36.21
D-MW10	04/24/96	16.5	6.0–16.0	2" PVC	734736.63	973863.88	36.74	34.59
D-MW11	04/23/96	17.0	6.0–16.0	2" PVC	735030.37	973246.80	34.25	34.10
D-MW12	04/22/96	16.0	5.6–15.6	2" PVC	734914.42	973431.24	36.08	35.87
D-MW13	04/22/96	15.5	5.0–15.0	2" PVC	734945.03	973597.82	36.35	36.17
D-MW14	04/22/96	15.5	5.0–15.0	2" PVC	734911.72	973742.45	35.18	35.03
D-MW15	04/25/96	15.0	4.7–14.7	2" PVC	734848.80	974000.95	35.37	35.18
D-MW16	04/25/96	15.0	4.9–14.9	2" PVC	734884.97	974084.47	35.70	35.48
D-MW17	04/22/96	17.0	6.5–16.5	2" PVC	735067.03	973516.64	35.55	35.35
D-MW18	04/23/96	17.0	6.6–16.6	2" PVC	735242.75	973282.66	35.00	34.82
D-MW19	04/22/96	16.5	6.0–16.0	2" PVC	735190.02	973480.86	35.24	34.94
D-MW20	04/23/96	17.5	7.0–17.0	2" PVC	735106.75	973739.62	36.43	36.25
D-MW22	04/23/96	16.5	6.0–16.0	2" PVC	735211.78	973618.31	35.09	34.88
D-MW23	04/23/96	15.5	5.0–15.0	2" PVC	735440.83	973753.82	34.07	33.80
D-MW24	04/23/96	15.3	5.0–15.0	2" PVC	735555.59	973736.04	34.44	34.24
D-MW25	04/24/96	15.2	4.8–14.8	2" PVC	735502.82	973912.83	34.68	34.54
D-MW26	04/24/96	15.0	4.7–14.7	2" PVC	735493.54	974081.96	35.87	35.63
D-MW27	04/24/96	15.0	4.5–14.5	2" PVC	735658.75	973857.54	34.45	34.25
Supplemental CAP–Part B Investigation – 2001								
D-MW33	02/02/01	20.0	9.0–19.0	4" PVC	735059.31	973158.38	33.89	33.48
D-MW34	02/04/01	18.0	7.0–17.0	4" PVC	734907.85	973152.66	35.88	35.55
D-MW35	02/05/01	18.0	7.0–17.0	4" PVC	734790.43	973182.01	36.89	36.46
D-MW36	02/03/01	18.0	7.0–17.0	4" PVC	734664.20	973252.29	36.61	36.24
D-MW37	02/06/01	18.0	7.0–17.0	4" PVC	734780.91	973344.15	37.07	36.83
D-MW38	02/04/01	18.0	7.0–17.0	4" PVC	734980.63	973350.28	35.14	34.89
D-MW39	02/03/01	17.5	7.0–17.0	4" PVC	735095.08	973364.58	34.18	33.73
D-MW40	02/02/01	19.0	8.0–18.0	4" PVC	735123.10	973267.69	33.81	33.43
D-MW41	02/06/01	18.0	7.0–17.0	4" PVC	735041.89	973691.07	36.42	36.12
D-MW42	02/06/01	18.0	7.0–17.0	4" PVC	734846.82	973568.48	36.11	35.87
D-MW43	02/05/01	18.0	7.0–17.0	4" PVC	734791.37	973063.02	36.79	36.42

NOTES:

[a] Wells installed during the Pumphouse #1 CAP–Part A and CAP–Part B investigations and DAACG facility investigation were resurveyed in February 2001 so that the reference datum would be consistent.

BGS Below ground surface.
CAP Corrective Action Plan.
DAACG Departure/Arrival Air Control Group.
PVC Polyvinyl chloride.

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APPENDIX III

WATER RESOURCES SURVEY DOCUMENTATION

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WATER RESOURCES SURVEY DOCUMENTATION

1.0 LOCAL WATER RESOURCES

As required by the Georgia Environmental Protection Division (GA EPD) underground storage tank Corrective Action Plan (CAP)–Part A guidance (GA EPD 1998a), a water resource survey documenting information for public and non-public water supply wells, surface water bodies, underground utilities, and potential receptors was conducted for the Former Pumphouse #1 site. The information presented in this section provides the supporting documentation for Section II.B.1 of the CAP–Part B Report (SAIC 2000).

1.1 WATER SUPPLY WELL SURVEY

The water supply well survey was conducted in accordance with the GA EPD guidelines/requirements listed below.

- Hunter Army Airfield (HAAF) is located in an area of average or higher groundwater pollution susceptibility (GA DNR 1976).
- All public supply wells, as defined by GA EPD, that exist within 2 miles of the investigation sites are to be located.
- All non-public supply wells that exist within 0.5 mile of the investigation sites are to be located.
- All supply wells nearest the investigation sites are to be located.
- All wells downgradient of the investigation sites are to be located.

The required survey was accomplished by obtaining information for the Fort Stewart Directorate of Public Works (DPW) and the City of Savannah Bureau of Water Operations, performing a field survey, obtaining a U.S. Environmental Protection Agency site map displaying the public water supply for HAAF, and conducting a U.S. Geological Survey (USGS) database search. A summary of the information obtained from the survey is provided in the following sections.

1.1.1 Fort Stewart Directorate of Public Works Survey Summary

According to the DPW, nine water supply wells are located within the confines of the HAAF area. These wells have the potential to provide up to 3,890 gallons per minute (gpm) of water to occupants of the HAAF installation. The Fort Stewart DPW was unable to provide documentation listing the companies responsible for well installation and drillers' logs showing as-built information and subsurface geologic data. The DPW provided well locations, pump rates, treatment methods, casing depths, and total depths for three of the nine wells located within 3 miles of the subject site (Table III-A). Documentation of subsurface geology based on HAAF drilling logs, however, remains extremely limited; therefore, other references containing deep-well information were used to document the subsurface geology and aquifer characteristics beneath the HAAF area.

Wells 1, 2, and 3 are located within a 2-mile radius of the Former Pumphouse #1 site. Wells 1 and 2 are both public water supply wells located in the cantonment area of HAAF, and constitute the main water supply system at the HAAF installation. Well 1, located at Building 711 on the corner of Moore Road and Douglas Street, is a 12-inch-diameter well with a 100-horsepower (hp) turbine pump serving a 100,000-gallon elevated storage tank (Tank 1) through 10-inch lines. Water from Well 1 is injected with hydrofluosilic acid and chlorine gas solution at the well house. Well 2, located at Building 1205 on the corner of Neal Street and

Lightning Road, is a 12-inch-diameter well with a 100-hp turbine pump serving a 200,000-gallon elevated tank (Tank 2) through 10-inch lines. Water from Well 2 is also injected with hydrofluosilic acid and chlorine gas solution at the well house. Wells 1 and 2 provide water to a 500,000-gallon elevated storage tank (Tank 3) located on Middleground Road behind noncommissioned officer family housing. This tank provides potable water to 694 service connections, which are used by an average of at least 5,000 individuals year-round.

Well 3 is a public supply well located outside the cantonment area of HAAF. Well 3, located at Building 8455, is a 4.0-inch-diameter well with a 1.0-hp electric submersible pump serving a 1,000-gallon hydropneumatic storage tank through 1.5-inch galvanized steel lines. Water from Well 3 is treated with calcium hypochlorite solution and is consumed by approximately 25 people during daytime hours year-round.

Pumping rates, casing depths, bore depths, treatment methods, and storage tank information for Wells 1, 2, and 3 are provided in Table III-A.

1.1.2 City of Savannah Bureau of Water Operations Survey Summary

Four city of Savannah water supply wells are located outside the boundary of HAAF, within 2 miles of the Former Pumphouse #1 site. The closest of these wells is Well 15, which is located 1.5 miles south of the site. Data concerning casing depths, borehole depths, casing sizes, and capacities are listed in Table III-B. The City of Savannah Bureau of Water Operations was unable to provide drilling logs or as-built well information.

1.2 SURFACE WATER BODIES

Surface water in the state of Georgia shall mean any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs producing 100,000 gallons per day, and all other bodies of surface water, natural or artificial, lying within or forming a part of the boundaries of the state that are not entirely confined and completely retained upon the property of a single individual, partnership, or corporation (GA EPD 1998b). The surface water body survey was conducted in accordance with the following GA EPD guidelines/requirements outlining water bodies to be surveyed:

- surface water bodies that exist within 1 mile of the investigation sites,
- all surface water bodies nearest the investigation sites if these bodies lie outside the 1-mile radius of concern,
- all surface water bodies downgradient of the investigation sites, and
- the storm and sanitary sewers adjacent to investigation sites.

The locations of surface water bodies at HAAF were obtained from USGS topographic maps and from maps provided by the DPW. Storm and sanitary sewer location maps, storm sewer invert elevations, and storm sewer and culvert construction details were provided by the DPW.

1.3 POTENTIAL RECEPTOR SURVEY SUMMARY OF THE FORMER PUMPHOUSE #1 SITE

Metcalf and Eddy conducted a field potential receptor survey for the Former Pumphouse #1 site. The site and adjacent areas were surveyed for locations of surface water bodies, utility lines, and basements. Basements do not exist in the buildings adjacent to the site. Additional information, provided by the Fort Stewart DPW,

was used to determine the location of the nearest public supply wells and downgradient surface water bodies not located during the field survey.

1.3.1 Water Supply Wells Near the Former Pumphouse #1 Site

The information below is presented to provide supplemental information to Section II.B.1 of the CAP–Part B Report (SAIC 2000) and presents details relating to public and non-public water supply wells located 2 miles and 1/2 mile, respectively, from the Former Pumphouse #1 site.

- Well 1, located on the corner of Moore Road and Douglas Street at Building 711, is approximately 5,700 feet north (upgradient) of the Former Pumphouse #1 site.
- Well 2, located at Building 1205 on the corner of Neal Street and Lightning Road, is approximately 4,200 feet northeast (upgradient) of the Former Pumphouse #1 site.
- Well 3, located at Building 8455, is approximately 6,700 feet southwest (downgradient) of the Former Pumphouse #1 site.

Based on this information, the site is classified as being located greater than 500 feet from these withdrawal points. There is no indication that Wells 1, 2, or 3 have been impacted based on the estimated nature and extent of petroleum-related groundwater contamination at the site; therefore, collection and analysis of groundwater samples from Wells 1, 2, or 3 are not recommended. Well 1 is being sampled as part of the Former Building 710, Facility ID#9-025029 monitoring program and has not contained any benzene, toluene, ethylbenzene, xylenes, or polynuclear aromatic hydrocarbons.

1.3.2 Surface Water Bodies Near the Former Pumphouse #1 Site

A man-made drainage ditch is located approximately 250 feet south of the Former Pumphouse #1 site. The man-made surface water drainage feature flows west toward Lamar Canal, which is located approximately 7,000 feet west of the Former Pumphouse #1 site. The surface water then flows to the southwest until it reaches Springfield Canal, which eventually joins the Little Ogeechee River more than 3 miles downstream of the site. Because of the ditch 160 feet southeast of the Former Pumphouse #1 site, the site is classified as being fewer than 500 feet from a downgradient surface water body.

1.3.3 Underground Utilities at the Former Pumphouse #1 Site

There are numerous underground water, electrical, and abandoned fuel lines that connect the former fuel pits located at the edge of the taxiway north of the former tank pits. These underground lines are located upgradient of the area of contamination around the former tank pits and are within the area of contamination near the Former Fuel Pit 1A/Departure/Arrival Air Control Group area. The invert depth of the former fuel transfer line in the vicinity of Fuel Pit 1A is approximately 6.4 feet below ground surface (BGS). Two monitoring wells are located in the vicinity of Fuel Pit 1A, and in March 2001, the depths to groundwater in these wells were 10.49 feet in P1-MW11and 10.98 feet in P1-MW13; therefore, the invert depth of the former fuel transfer line is located approximately 4.0 feet above the water table. The water and electrical lines run adjacent to the former fuel transfer line. It is estimated that the invert depths of these utilities are no more than 5 feet BGS.

1.4 REFERENCES

GA DNR (Georgia Department of Natural Resources) 1976. *Geologic Map of Georgia*, Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey (reprinted 1997).

GA EPD (Georgia Environmental Protection Division) 1998a. *Guidance Document for the Preparation of an Underground Storage Tank Corrective Action Plan, Part A*, May.

GA EPD 1998b. *Rules of Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-6, Water Quality Control*, May.

SAIC (Science Applications International Corporation) 2000. *Corrective Action Plan–Part B for Former Pumphouse #1, Facility ID #9-025085, Building 8060, Hunter Army Airfield, Georgia*, August.

Table III-A. Water Supply Well Information Provided by the Fort Stewart DPW

Building	Well ID	Year Drilled	Bore Depth	Casing Depth	Pump Rate (gpm)	Number of Service Connections	Population	Public or Non-Public Supply
711	1	1941	550	250	1,300	525	7,500	Public
1205	2	1941	600	250	1,300	525	7,500	Public
8455	3	1951	360	40	30	2	25	Public
8581	4a	1976	300	92	80	10	15	Public

Table III-B. Water Supply Information Provided by the City of Savannah Bureau of Water Operations

Well ID	Year Drilled	Bore Depth	Casing Depth	Pump Rate (gpm)	Number of Service Connections	Population	Public or Non-Public Supply
6	TBD	750	1,240	1,500	TBD	TBD	Public
13	TBD	TBD	TBD	2,200	TBD	TBD	Public
14	TBD	800	338	571	TBD	TBD	Public
15	TBD	414	252	1,000	TBD	TBD	Public
23	TBD	639	320	1,056	TBD	TBD	Public
25	TBD	540	287	1,120	TBD	TBD	Public
27	TBD	550	321	1,468	TBD	TBD	Public

NOTE:
TBD = To be determined

APPENDIX IV

SOIL BORING LOGS

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Boring logs associated with the Former Pumphouse #1 Corrective Action Plan (CAP)–Part A investigation, Former Pumphouse #1 CAP–Part B investigation, and Departure/Arrival Air Control Group facility CAP–Part B investigation were provided in the CAP–Part B Report dated August 2000. Data from boring logs associated with wells D-MW33 through D-MW43, which were installed as part of the supplemental investigation, are provided in this appendix.

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HTRW DRILLING LOG

HOLE NUMBER D-MW33

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE				
	2	SLITY SAND (SM), fine to medium grained, subrounded, loose, light yellowish brown (2.5Y6/3)	734 ppm			
		SAND (SP), fine to medium grained, subrounded to subangular, soft, loose pale yellow (2.5Y7/3)	968ppm			
	4		647ppm			
					Soil Sample AK3311	
	6		672ppm			
		CLAY (CL), stiff, moist, low plasticity, gray (5Y6/1)	1411 ppm			
	8		38.7ppm			
	10	SAND (SP), fine to medium grained, well sorted, white (5Y8/1)	436ppm			
	12		829ppm			▽ = 12.5 ft is water
	14					
	16					
	18					
	20	END OF DRILLING AT 20.0 ft				

HTRW DRILLING LOG

HOLE NUMBER D-MW34

PROJECT: Former Pumphouse #1

INSPECTOR H. Smith

SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	CONCRETE				
	2	silty SAND (SM), fine to medium grained, loose, soft, yellowish brown (10YR5/4)	1.9ppm			
	4		13.7ppm			
		SAND (SP), fine grained, loose, soft, white (10YR8/1)				
		Silty SAND (SM), fine to medium grained, soft, loose, white (10YR8/1)	4.6ppm			
	8		8.9ppm			
	10	-color change to light gray (10YR7/2)	192ppm		Soil SAMPLE AK3411	
	12		6.6ppm			▽ WATER AT 12.5
			0.0ppm			
	14					
	16					
	18	END OF DRILLING AT 18.0 FT.				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW35

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		ASPHALT				
		CONCRETE				
	2	Silty SAND (SM), fine to medium grained, subangular to subrounded, soft, very dark brown (10YR 2/2)	721 ppm			
		- color change to very pale brown (10 YR 7/4)				
	4	- color change to white (10 YR 8/1)	60.4 ppm			
	6	- color change to very pale brown (10YR 7/4)	607 ppm			
	8		2100 ppm			
	10	SAND (SP), fine to medium grained, rounded to subangular, soft, loose, white (5 Y 8/1)	76.9 ppm			
		- color change to pale yellow (2.5 Y 8/2)			SOIL SAMPLE AK3511	
	12		>2500 ppm			
	14					When rods were pulled from the augess at 10-15 ft, a frothey smelly oily mess was above the water mark on the rods
	16					
	18	END OF DRILLING AT 18.0				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW36

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE				
	2	Silty SAND (SM), fine to medium grained, loose, soft, yellowish brown (10YR5/4)	387ppm			
	4		95.3ppm			
		- color change to very pale brown (10YR7/4)	621ppm		SOIL SAMPLE AK3611	
	6		329ppm			
		- color change to very dark gray (7.5YR3/1)	503ppm			
	8	- color change to brown (7.5YR4/3	510ppm			
	10		658			
		CLAY (CL), hard, firm, gray (2.5Y6/1)				
	12		19.2ppm			▽ =
		Silty SAND, medium to fine grained, pale yellow				
	14		8.8ppm			
		- color change to white				
	16					
	18	END OF DRILLING AT 18.0FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW37

PROJECT: Former Pumphouse #1 | INSPECTOR H.Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		ASPHALT				
		CONCRETE				
	2	Silty SAND (SM), fine to medium grained, gray (2.5Y 5/1) and light yellowish brown (10YR 6/4)	245ppm			
	4	SAND (SP), fine grained, loose subrounded, white (10YR 8/1)	26.1ppm			
	6	Silty SAND (SM), fine to medium grained, subrounded to subangular, dark brown (7.5YR 3/2) to very dark brown (7.5YR 2.5/3)	15.5ppm			
	8		201ppm			
	10		672ppm		Soil Sample AK3711	▽ WATER AT 11.2 ft
	12	CLAY (CL), hard, stiff, Gray (5Y 5/1)	1.2ppm	GEOTECH SAMPLE		
	14	Silty SAND (SM), medium grained, well sorted, sub-angular, wet, white (5YR 8/1)	0.6ppm			
	16					
	18	END OF DRILLING AT 18.0 FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW38

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	CONCRETE				
	2	silty SAND (SM), fine to medium grained, subangular to subrounded, soft, loose, moist, light brownish gray (2.5Y6/2)	1.2 ppm			
	4	- color change to dark brown (7.5YR 3/3) - color change to very dark brown (7.5YR 5/2)	66.4 ppm			
	6		140 ppm			
	8	- color change to pale yellow (2.5Y7/3)	149 ppm			
	10		568 ppm		SOIL SAMPLE AK3811	
	12	CLAY (CL), hard, stiff, firm, gray (5Y6/1)	18.6 ppm			Very strong hydrocarbon odor when auger reached 12.5 to 15.0 feet.
	14	SAND (SP), fine to medium grained, subangular to subrounded, wet, white	7.8 ppm			
	16					
	18	END OF DRILLING AT 18.0 FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW39

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	CONCRETE				
	2	SAND (SP), fine to medium grained, subangular to subrounded, loose, light gray (2.5Y 7/2)	19.0 ppm			
		- color change to yellowish brown (10 YR 5/4)				
	4		56.8 ppm			
	6		57.7 ppm			
	8		185 ppm		SOIL SAMPLE AK3911	
	10		279 ppm			
		CLAY (CL), hard, stiff, low plasticity, gray (5Y 6/1)				
	12		13 ppm			$\frac{\nabla}{=}$ WATER AT 12.0FT
	14					
	16					
		END OF DRILLING AT 17.5FT				
	18					
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW40

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	CONCRETE				
	2	SAND (SP), fine to medium grained, very dark grayish brown (10YR 3/2)	1.4ppm			
		- color change to very pale brown (10YR 7/3)				
	4		240ppm			
		- color change to yellowish brown				
	6	- color change to very pale brown (10YR 7/3)	98.6ppm			
	8					
	10		1273ppm		SOIL SAMPLE AK4011	
		CLAY (CL), firm, hard, plastic, gray (5Y 5/1) some sand at 12.1 to 13.0				
	12		735ppm			
						▽ WATER AT 13.5 ft
	14		2.1ppm			
		SAND, fine to medium grained				
	16					
	18					
		END OF DRILLING AT 19.0 FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW11

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE				
	2	Silty SAND (SM), fine to medium grained, subrounded to subangular, soft, dry, dark brown (10YR 3/3	1.7 ppm			
	4		0.8 ppm			
	6		1.9 ppm			
		– color change to brownish yellow (10YR 6/6)				
	8		2.2 ppm			
	10		0.8 ppm		Soil Sample AKU111	
	12		1.8 ppm			▽ Water at 12.3 ft
	14		1.8 ppm			
	16					
	18	END OF DRILLING AT 18.0 FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW42

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	Concrete				
	2	Silty SAND (SM), fine to medium grained, 30% silt, very dark gray (10 YR 3/1)	121 ppm			
		- color change to light brownish gray (10 YR 6/2)				
	4	- color change to very dark brown (10 YR 2/2)	46.6 ppm			
	6	- color change to lt. yellowish brown (10 YR 6/4)	85.7 ppm			
		- color change to very pale brown (10 YR 7/3)				
	8	- color change to dark yellowish brown	544 ppm		Soil Sample AK4211	
	10	- color change to light gray (10 YR 7/1	190 ppm			
	12		0.6 ppm			▽ = WATER AT 12.0 ft
	14					
	16					
	18	END OF DRILLING AT 18.0 FT				
	20					

HTRW DRILLING LOG

HOLE NUMBER D-MW43

PROJECT: Former Pumphouse #1 | INSPECTOR H. Smith | SHEET 1 OF 1

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		ASPHALT				
		CONCRETE				
	2	Silty SAND (SM), fine to medium grained, subangular to subrounded, soft, loose, dark grayish brown (10 YR 4/2)	31.8 ppm			
		- color change to pale brown (10 YR 6/3)				
	4		0.0 ppm			
		- color change to very pale brown (10 YR 8/2)				
	6		1.3 ppm			
		- color change to white (10 YR 8/1)			SOIL SAMPLE AK4311	
	8		22.8 ppm			
	10	- color change to light gray (2.5 Y 7/2)	4.6 ppm			
	12		14.2 ppm			
						▽ water at 13.6 ft
	14		17.3 ppm			
	16					
	18	END OF DRILLING AT 18.0 FT				
	20					

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APPENDIX V

SOIL LABORATORY RESULTS

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Soil samples were collected during the Former Pumphouse #1 Corrective Action Plan (CAP)–Part A investigation, Former Pumphouse #1 CAP–Part B investigation, and Departure/Arrival Air Control Group facility CAP–Part B investigation, and the analytical results were provided in the CAP–Part B Report dated August 2000. Additional soil samples were collected during the supplemental investigation activities in February 2001, and the results are summarized in Table V-A. Copies of the validated analytical data sheets are also provided in this appendix.

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Table V-A. Summary of the Soil Analytical Results for the Supplemental Investigation at Former Fuel Pit 1A/DAACG Area (Release #1)

Location	GUST	D-MW33	D-MW34	D-MW35	D-MW36	D-MW37	D-MW38
Sample ID	Soil	AK3311	AK3411	AK3511	AK3611	AK3711	AK3811
Sample Interval (feet)	Threshold	5.0–7.5	10.0–12.5	11.0–12.5	5.0–7.0	10.0–12.0	10.0–11.5
Date	Levels[a]	02-Feb-01	03-Feb-01	05-Feb-01	03-Feb-01	06-Feb-01	04-Feb-01
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Volatile Organic Compounds							
Benzene	0.017	0.269 U	0.220 U	11.3 U	1.44 J	1.3 =	0.131 U
Toluene	115	0.269 U	5.51 =	2,550 =	74.4 =	45.6 =	0.196 U
Ethylbenzene	18	0.464 =	4.32 =	355 =	16.2 =	3.87 =	0.58 =
Xylenes, total	700	0.456 =	17.8 =	1,860 =	80.9 =	15.7 =	3.93 =
Polynuclear Aromatic Hydrocarbons							
2-Chloronaphthalene	NRC	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Acenaphthene	NRC	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Acenaphthylene	NRC	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Anthracene	NRC	0.0403 U	0.0389 U	0.0133 J	0.0378 U	0.0473 U	0.0427 U
Benzo(*a*)anthracene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Benzo(*a*)pyrene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Benzo(*b*)fluoranthene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Benzo(*g,h,i*)perylene	NRC	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Benzo(*k*)fluoranthene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Chrysene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Dibenzo(*a,h*)anthracene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Fluoranthene	NRC	0.0403 U	0.0389 U	0.0688 =	0.0378 U	0.0473 U	0.0427 U
Fluorene	NRC	0.0403 U	0.0389 U	0.0722 =	0.0378 U	0.0473 U	0.0188 J
Indeno(*1,2,3-cd*)pyrene	0.66	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Naphthalene	NRC	0.0403 U	0.0389 U	0.828 =	0.0378 U	0.147 =	0.0427 U
Phenanthrene	NRC	0.0403 U	0.0389 U	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Pyrene	NRC	0.0403 U	0.0141 J	0.0425 U	0.0378 U	0.0473 U	0.0427 U
Other Analytes							
Lead	NRC	5.78 =	2.42 =	9.74 =	23.5 =	26.0 =	8.06 =

NOTES:

[a]Georgia Department of Natural Resources Applicable Soil Threshold Levels (Table B, Column 1).
DAACG Departure/Arrival Air Control Group.
GUST Georgia Underground Storage Tank.
NRC No regulatory criteria.

Laboratory Qualifiers

U Indicates that the compound was not detected above the reported sample quantitation limit.
UJ Indicates that the compound was not detected above an approximated sample quantitation limit.
J Indicates that the value for the compound was an estimated value.
= Indicates that the compound was detected at the concentration reported.

Table V-A. Summary of the Soil Analytical Results for the Supplemental Investigation at Former Fuel Pit 1A/DAACG Area (Release #1)

Location	GUST	D-MW39	D-MW40	D-MW41	D-MW42	D-MW43
Sample ID	Soil	AK3911	AK4011	AK4111	AK4211	AK4311
Sample Interval (feet)	Threshold	7.0–11.0	10.0–12.5	10.0–12.5	7.0–9.2	7.0–9.2
Date	Levels[a]	2-Feb-01	02-Feb-01	06-Feb-01	06-Feb-01	05-Feb-01
Units	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Volatile Organic Compounds						
Benzene	0.017	0.232 U	1.48 U	0.00048 J	0.0025 U	0.0013 U
Toluene	115	0.0949 J	0.381 J	0.0024 U	0.0087 =	0.0013 U
Ethylbenzene	18	1.24 =	0.345 J	0.0024 U	0.136 J	0.0013 U
Xylenes, total	700	3.08 =	13.3 =	0.0015 J	0.593 =	0.0039 U
Polynuclear Aromatic Hydrocarbons						
2-Chloronaphthalene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Acenaphthene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0186 J	0.0353 U
Acenaphthylene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Anthracene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0209 J	0.0353 U
Benzo(*a*)anthracene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0256 J	0.0353 U
Benzo(*a*)pyrene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Benzo(*b*)fluoranthene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Benzo(*g,h,i*)perylene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Benzo(*k*)fluoranthene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Chrysene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0207 J	0.0353 U
Dibenzo(*a,h*)anthracene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Fluoranthene	NRC	0.0095 J	0.0436 U	0.0410 U	0.0901 =	0.0353 U
Fluorene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0203 J	0.0353 U
Indeno(*1,2,3-cd*)pyrene	0.66	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Naphthalene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0358 U	0.0353 U
Phenanthrene	NRC	0.0394 U	0.0436 U	0.0410 U	0.119 =	0.0353 U
Pyrene	NRC	0.0394 U	0.0436 U	0.0410 U	0.0675 =	0.0353 U
Other Analytes						
Lead	NRC	12.9 =	3.56 =	1.54 U	22.0 =	2.93 =

NOTES:

[a]Georgia Department of Natural Resources Applicable Soil Threshold Levels (Table B, Column 1).

DAACG Departure/Arrival Air Control Group.

GUST Georgia Underground Storage Tank.

NRC No regulatory criteria.

Laboratory Qualifiers

U Indicates that the compound was not detected above the reported sample quantitation limit.

UJ Indicates that the compound was not detected above an approximated sample quantitation limit.

J Indicates that the value for the compound was an estimated value.

= Indicates that the compound was detected at the concentration reported.

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

AK3311

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 37197

Matrix: (soil/water) SOIL Lab Sample ID: 37197001

Sample wt/vol: 4.5 (g/mL) G Lab File ID: 2V408

Level: (low/med) MED Date Received: 02/03/01

% Moisture: not dec. 17 Date Analyzed: 02/08/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0 1:100

Soil Extract Volume: 10000(uL) Soil Aliquot Volume: 100(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
71-43-2	Benzene	269	U	U
108-88-3	Toluene	269	U	U
100-41-4	Ethylbenzene	464		
1330-20-7	Xylenes (total)	456		

DATA VALIDATION COPY

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

AK3311

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 37197

Matrix: (soil/water) SOIL Lab Sample ID: 37197001

Sample wt/vol: 30.0 (g/mL) G Lab File ID: 2G322

Level: (low/med) LOW Date Received: 02/03/01

% Moisture: 17 decanted: (Y/N) N Date Extracted: 02/07/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 02/08/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
91-20-3	Naphthalene	40.3	U
91-58-7	2-Chloronaphthalene	40.3	U
208-96-8	Acenaphthylene	40.3	U
83-32-9	Acenaphthene	40.3	U
86-73-7	Fluorene	40.3	U
85-01-8	Phenanthrene	40.3	U
120-12-7	Anthracene	40.3	U
206-44-0	Fluoranthene	40.3	U
129-00-0	Pyrene	40.3	U
56-55-3	Benzo(a)anthracene	40.3	U
218-01-9	Chrysene	40.3	U
205-99-2	Benzo(b)fluoranthene	40.3	U
207-08-9	Benzo(k)fluoranthene	40.3	U
50-32-8	Benzo(a)pyrene	40.3	U
193-39-5	Indeno(1,2,3-cd)pyrene	40.3	U
53-70-3	Dibenzo(a,h)anthracene	40.3	U
191-24-2	Benzo(ghi)perylene	40.3	U

u

DATA VALIDATION COPY

TOTAL METALS
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

SDG No.: 37197 Method Type: SW-846

Sample ID: 37197001 Client ID: AK3311

Contract: SAIC01500 Lab Code: GEL Case No.: GEL SAS No.:

Matrix: SOIL Date Received: 2/3/01 Level: LOW % Solids: 82.70

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7439-92-1	Lead	5.78	mg/kg			P	0.25	TJA61 Trace ICP1	20501

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

DATA VALIDATION COPY

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

AK3411

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 37197

Matrix: (soil/water) SOIL Lab Sample ID: 37197004

Sample wt/vol: 5.3 (g/mL) G Lab File ID: 2V410

Level: (low/med) MED Date Received: 02/04/01

% Moisture: not dec. 14 Date Analyzed: 02/08/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0 1:100

Soil Extract Volume: 10000(uL) Soil Aliquot Volume: 100(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
71-43-2	Benzene	220	U	U
108-88-3	Toluene	5510		=
100-41-4	Ethylbenzene	4320		=
1330-20-7	Xylenes (total)	17800		=

DATA VALIDATION COPY

APPENDIX IX

CONTAMINATED SOIL DISPOSAL

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During underground storage tank removal and excavation activities in 1995, all contaminated soil removed during the closure was tested in accordance with disposal facility requirements and transported to Kedesh, Inc., Highway 84, Ludowici, GA 31316. Approximately 913 cubic yards of contaminated soil were excavated from the Former Pumphouse #1 site. All soil excavated during the tank removal activities in 1998 was returned to the tank pit with Georgia Environmental Protection Division concurrence.

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APPENDIX X

SITE RANKING FORM

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SITE RANKING FORM

Facility Name: Former Fuel Pit 1A/DAACG Area (Release #1) **Ranked by:** S. Stoller

County: Chatham **Facility ID #:** 9-025085 **Date Ranked:** 8/9/2001

SOIL CONTAMINATION

A. Total PAHs –
Maximum Concentration found on the site
(Assume <0.660 mg/kg if only gasoline was stored on site)

- ☐ ≤0.660 mg/kg = 0
- ☐ >0.66 - 1 mg/kg = 10
- ☐ >1 - 10 mg/kg = 25
- * ☒ >10 mg/kg = 50

** 1996 DAACG CAP-Part B sample H833-WB1302 at 3.5' – 5.5'*

B. Total Benzene -
Maximum Concentration found on the site

- ☐ ≤0.005 mg/kg = 0
- ☐ >0.005 - .05 mg/kg = 1
- ☐ >0.05 - 1 mg/kg = 10
- ☐ >1 - 10 mg/kg = 25
- ☐ >10 - 50 mg/kg = 40
- * ☒ >50 mg/kg = 50

** 1996 DAACG CAP-Part B sampleH833-WB1702 at 8' – 10'*

C. Depth to Groundwater
(bls = below land surface)

- ☐ >50' bls = 1
- ☐ >25' - 50' bls = 2
- ☐ >10' - 25' bls = 5
- ☒ ≤10' bls = 10

Fill in the blanks: (A. 50) + (B. 50) = (100) x (C. 10) = (D. 1000)

GROUNDWATER CONTAMINATION

E. Free Product (Nonaqueous-phase liquid hydrocarbons; See Guidelines For definition of "sheen").

- ☐ No free product = 0
- ☐ Sheen - 1/8" = 250
- ☐ >1/8" - 6" = 500
- ☐ >6" - 1ft. = 1,000
- ☒ For every additional inch, add another 100 points = 1,000 + 1,000

** 22.7 inches in D-MW34 (July 2001)*

F. Dissolved Benzene -
Maximum Concentration at the site
(One well must be located at the source of the release.)

- ☐ ≤5 µg/L = 0
- ☐ >5 - 100 µg/L = 5
- * ☒ >100 - 1,000 µg/L = 50
- ☐ >1,000 - 10,000 µg/L = 500
- ☐ >10,000 µg/L = 1500

** Sample from D-MW35 (March 2001)*

Fill in the blanks: (E. 2000) + (F. 50) = (G. 2050)

Facility Name: Former Fuel Pit 1A/DAACG Area **Facility ID #:** 9-025085

POTENTIAL RECEPTORS (MUST BE FIELD-VERIFIED)

Distance from nearest contaminant plume boundary to the nearest downgradient and hydraulically connected Point of Withdrawal for water supply. **If the point of withdrawal is not hydraulically connected, evidence as outlined in the CAP-A guidance document MUST be presented to substantiate this claim.**

H. Public Water Supply

☐	Impacted	= 2000
☐	≤500'	= 500
☐	>500' - ¼ mi	= 25
☐	¼ mi - 1 mi	= 10
☐	>1 mi - 2 mi	= 2
* ☒	> 2 mi	= 0

For lower susceptibility areas only:

☐	>1 mi	= 0

I. Non-Public Water Supply

☐	Impacted	= 1000
☐	≤100'	= 500
☐	>100' - 500'	= 25
☐	>500' - ¼ mi	= 5
☐	>¼ - ½ mi	= 2
☒	>½ mi	= 0

For lower susceptibility areas only:

☐	>¼ mi	= 0

Note: If site is in lower susceptibility area, do not use the shaded areas.

* For justification that withdrawal point is not hydraulically connected, see attached text.

J. Distance from nearest Contaminant Plume boundary to downgradient Surface Waters **OR UTILITY TRENCHES & VAULTS** (a utility trench may be omitted from ranking if its invert elevation is more than 5 feet above the water table)

☐	Impacted	= 500
☒	≤500'	= 50
☐	>500' - 1,000'	= 5
☐	>1,000'	= 2

K. Distance from any Free Product to basements and crawl spaces

☐	Impacted	= 500
☐	<500'	= 50
☐	>500' - 1,000'	= 5
☒	>1,000' or no free product.	= 0

Fill in the blanks: (H. 0) + (I. 0) + (J. 50) + (K. 0) = **L. 50**

(G. 2050) x (L. 50) = **M. 102,500**

(M. 102,500) + (D. 1000) = **N. 103,500**

P. **SUSCEPTIBILITY AREA MULTIPLIER**

☐ If site is located in a Low Ground-Water Pollution Susceptibility Area = 0.5

☒ All other sites = 1

Q. **EXPLOSION HAZARD**

Have any explosive petroleum vapors, possibly originating from this release, been detected in any subsurface structure (e.g., utility trenches, basements, vaults, crawl spaces, etc.)?

☐ Yes = 200,000

☒ No = 0

Fill in the blanks: (N. 103,500) x (P. 1) = (103,500) + (Q. 0)

= 103,500 (for Former Fuel Pit 1A/DAACG Area based on 2001 groundwater concentration in D-MW35)

ENVIRONMENTAL SENSITIVITY SCORE

OTHER GEOLOGIC AND HYDROLOGIC DATA

The following information is presented to provide supplemental information to Item H of the Site Ranking Form and details relating to the geologic and hydrogeologic conditions at Hunter Army Airfield (HAAF) that support HAAF's determination that the water withdrawal point(s) located at the airfield is (are) not hydraulically connected to the surficial aquifer.

1.0 REGIONAL AND LOCAL GEOLOGY

Southeastern Georgia is located within the coastal plain physiographic province of the southeastern United States (Clark and Zisa 1976). In this region the thickness of southeastward-dipping subsurface strata ranges from 0 feet at the fall line, located approximately 150 miles inland from the Atlantic coast, to approximately 4,200 feet below ground surface at the coast. Herrick (1961) provides detailed lithologic descriptions of the stratigraphic units encountered during the installation of water and petroleum exploration wells in Chatham County. The well log of GGS Well 125, located on White Bluff Road 700 feet west and 0.3 mile north of Buckhalter Road, Savannah, provides one of the more complete lithologic descriptions of upper Eocene, Miocene, and Pliocene to Recent sedimentary strata in Chatham County.

The upper Eocene (Ocala Limestone) section of GGS Well 125 is approximately 225 feet thick and dominated by light gray to white, fossiliferous limestone. The Miocene section is approximately 250 feet thick and consists of limestone with a 160-foot-thick cap of dark green phosphatic clay. This clay is regionally extensive and is known to occupy the Coosawatchie Formation of the Hawthorn Group (Furlow 1969; Arora 1984). The interval from approximately 80 feet to the surface is Pliocene to Recent in age and composed primarily of sand interbedded with clay and silt. This section is occupied by the Satilla and Cypresshead Formations.

HAAF is located within the barrier island sequence district of the coastal plain physiographic province of the southeastern United States (Clark and Zisa 1976). The barrier island sequence district in Chatham and Bryan counties is characterized by the existence of several marine terraces (step-like topographic surfaces that decrease in elevation toward the coast). These marine terraces, and their associated deposits, are the results of sea level fluctuations that occurred during the Pleistocene epoch. The surficial (Quaternary) deposits in Chatham and Bryan counties, in decreasing elevation and age, are part of the Okefenokee, Wicomico, Penholoway, Pamlico, and Silver Bluff terrace complexes.

HAAF, as well as most of Chatham County, is underlain by the Pleistocene Pamlico Terrace. The Pleistocene Satilla Formation (formerly known as the Pamlico Formation) consists of deposits of the Pamlico Terrace complex and other terrace complexes in the region. The Satilla Formation is a lithologically heterogeneous unit that consists of variably bedded to non-bedded sand and variably bedded silty to sandy clay. During the Pleistocene, these sand and clay deposits were formed in offshore and inner continental shelf, barrier island, and marsh/lagoonal-type environments. According to the *Geologic Map of Georgia* (GA DNR 1976), clay beds of marsh origin, which were deposited on the northwestern side of the former Pamlico barrier island complex, exist in the western quarter of HAAF. Very fine- to coarse-grained sand deposits of barrier island origin are more common throughout the remaining areas of HAAF.

Based on the coring and sampling of unconsolidated strata at HAAF during the Corrective Action Plan–Part A investigations, it was concluded that all former underground storage tanks (USTs) were buried within the Satilla Formation, which is overlain by various soil types. Soil groups at HAAF include the Chipley, Leon, Ellabelle, Kershaw, Pelham, Albany, Wahee, and Ogeechee (Wilkes et al. 1974).

2.0 REGIONAL AND LOCAL HYDROGEOLOGY

The hydrogeology in the vicinity of HAAF is mostly influenced by two aquifer systems. These are referred to as the Principal Artesian (Floridan) Aquifer and the surficial aquifer (Miller 1990). The Principal Artesian Aquifer is the lowermost hydrologic unit and is regionally extensive from South Carolina through Georgia, Alabama, and most of Florida. Known elsewhere as the Floridan, this aquifer, approximately 800 feet in total thickness, is composed primarily of Tertiary-age limestone including the Bug Island Formation, the Ocala Group, and the Suwannee Limestone. Groundwater from the Floridan is used primarily for drinking water (Arora 1984). According to Miller (1990), one of the largest cones of depression produced in the Upper Floridan Aquifer exists directly beneath Savannah, Georgia. Net water-level decline in the Floridan system between the predevelopment period and 1980 exceeded 80 feet beneath Savannah. In addition, according to 1980 estimates, more than 500 million gallons of water per day were withdrawn from the Floridan for public and industrial use in southeastern Georgia, more than any other region.

The confining layer for the Principal Artesian (Floridan) Aquifer is the phosphatic clay of the Hawthorn Group. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990). The surficial aquifer overlies the Hawthorn confining unit.

The surficial aquifer consists of widely varying amounts of sand and clay, ranging from 55 feet to 150 feet in thickness, and is composed primarily of the Satilla and Cypresshead Formations in the Savannah vicinity (Arora 1984). This aquifer is primarily used for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 feet to 10 feet below ground level (Miller 1990). Groundwater in the surficial aquifer system is under unconfined, or water table, conditions. Locally, however, thin clay beds create confined or semiconfined conditions, as is the case at HAAF where thin, surficial clay beds are present in the western quadrant (GA DNR 1976).

Groundwater encountered at all the UST investigation sites is part of the surficial aquifer system. Based on the facts that all public and non-public water supply wells draw water from the Principal Artesian (Floridan) Aquifer and that the Hawthorn confining unit separates the Principal Artesian Aquifer from the surficial aquifer, it is concluded that there is no hydraulic interconnection between the surficial aquifer (and associated groundwater plumes, if applicable) located beneath former UST sites and identified water supply withdrawal points at HAAF.

3.0 REFERENCES

Arora, Ram, 1984. *Hydrologic Evaluation for Underground Injection Control in the Coastal Plain of Georgia*, Department of Natural Resources, Environmental Protection Division, Georgia Geological Survey.

Clark, W. Z., Jr., and A.C. Zisa 1976. *Physiographic Map of Georgia*, Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey (reprinted 1988).

Furlow, J.W., 1969. *Stratigraphy and Economic Geology of the Eastern Chatham County Phosphate Deposit*, Department of Mines and Mining, Division of Conservation, Georgia Geologic Survey, Bulletin 82.

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Herrick, S.M., 1961. *Well Logs of the Coastal Plain of Georgia*, Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey.

Miller, James A., 1990. *Groundwater Atlas of the United States*, U.S. Department of the Interior, U.S. Geological Survey, Hydrologic Inventory Atlas 730G.

Wilkes, R.L., J.H. Johnson, H.T. Stoner, and D.D. Bacon 1974. *Soil Survey of Bryan and Chatham Counties, Georgia,* U.S. Department of Agriculture Soil Conservation Service.

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APPENDIX XI

COPIES OF PUBLIC NOTIFICATION LETTERS AND CERTIFIED RECEIPTS OF NEWSPAPER NOTICE

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AFFIDAVIT OF PUBLICATION
SAVANNAH MORNING NEWS

STATE OF GEORGIA
COUNTY OF CHATHAM

Personally appeared before me, LYNNETTE TUCK, to me known, who being sworn, deposes and says:

That she/he is the CLASSIFIED INSIDE SALES MANAGER of Southeastern Newspaper Corporation, a Georgia corporation, doing business in Chatham County, Ga., under the trade name of Savannah Morning News, a daily newspaper published in said county;

That she/he is authorized to make affidavits of publication on behalf of said published corporation;

That said newspaper is of general circulation in said county and in the area adjacent thereto;

That she/he has reviewed the regular editions of the Savannah Morning News, published on:

4-1, 2001, 4-8, 2001,

__________, 2001, __________, 2001,

and finds that the following advertisement, to-wit:

Don't forget to pick up your copy today!

015 Miscellaneous Notices

PUBLIC NOTICE
Notification of Corrective Action Plan Underground Storage, Tank Releases Fort Stewart, Ga. and Hunter Army Airfield, Ga.

The Georgia EPD (GEPD) has required Fort Stewart Directorate of Public Works to prepare Corrective Action Plans Part A or Part B to investigate and/or clean up contamination at the underground storage tank sites at Fort Stewart or Hunter Army Airfield as listed at the end of this notification.

This plans will be submitted to the GEPD on or before September 30, 2001.

If you want to examine a copy of one or more of the plans, please contact: Environmental Branch (Attn: T. Kelland), HQS 3D IN DIV (MECH), Directorate of Public Works, Bldg. 1137, 1550 Frank Cochran Dr., Fort Stewart, Ga. 31314-4927.

A copy will be mailed at a nominal fee.

Comments to the plan(s) will be accepted until October 30, 2001, and should be directed to GEPD at 404-362-2687.

Following is the mailing address: GEPD USTMP, 4244 International Parkway, Suite 104, Atlanta, Ga. 30354.

Hunter Army Airfield Part B Underground Storage Tank Sites:
Site; Facility ID#; Building
117, 9-025113*, 7002
25 and 26, 9-025008, 1342
Former Pumphouse #1, 9-025085, 8060

Fort Stewart Part B Underground Storage Tank Sites:
Site; Facility ID#; Building
276-279, 0-089156, Victory Shoppette

Lynnette Tuck
(Deponent)

Appeared in each of said editions.
Sworn to and subscribed before me

This 8 day of Apr, 2001

Lillie D. Lang
Notary Public, Chatham County, Ga.
LILLIE D. LANG
Notary Public, Chatham County, Ga.
My Commission Expires Apr. 8, 2001

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ATTACHMENT A

FIELD BAILOUT TEST RESULTS

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A.0 BAILOUT TESTS

A.1 INTRODUCTION

The use of monitoring wells is the most common method of defining product plumes. The product thickness measured in the monitoring wells is an apparent product thickness, which is greater than the actual product thickness within the formation. If the measured apparent product thickness is greater than the actual formation product thickness, then at some point during the accumulation of product in the well bore, the apparent product thickness equals the actual product thickness. The field bailout test method was developed by Thomas Gruszczenski to determine the actual product thickness. The procedure was published in 1987 in the *Proceedings of the NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water – Prevention, Detection and Restoration.* The paper outlining the procedure was titled "Determination of a Realistic Estimate of the Actual Formation Product Thickness Using Monitoring Wells: A Field Bailout Test." A summary of the field procedure and methodology for analyzing the results is provided in the following section.

The results of the free-phase product testing using the field bailout test method are similar to those of a rising head slug test. The results of the test yield two basic curve types, depending on the amount of free-phase product accumulation in the well. A "Type I curve" is associated with free-phase product accumulations of less than 12 inches and indicates a one-to-one correspondence between the measured and actual formation free-phase product thickness. "Type II curves" are associated with free-phase product accumulations greater than 12 inches and result in interpretation of an inflection point prior to stabilization of water and free-phase product levels. This inflection point is used to interpret the measured and actual formation of free-phase product thickness.

A.2 METHODOLOGY

The product testing was performed in selected wells to determine the actual amount of product on the groundwater surface in the vicinity of the wells. Product and groundwater level measurements were taken using an oil/water interface probe, which detects product and water, by different conductivity values. The field bailout test method included the following steps:

1. Measure and record the static product level and groundwater level using an oil/water interface probe to determine the apparent product thickness in the well.

2. Bail or pump the water/product from the well. Bailing or pumping should continue until all the product is removed from the well bore or until it reaches a constant thickness in the bailer after numerous bailer volumes have been removed. Record the volume of product and groundwater extracted from the well.

3. Measure and record the rising water/product interface level and the top-of-product level with time. Timing begins upon taking of the first reading. The suggested reading frequency is every 30 seconds for 0 to 5 minutes, 1 minute for 5 to 10 minutes, 2 minutes for 10 to 30 minutes, 5 minutes to 30 to 60 minutes, and as necessary for greater than 60 minutes

4. Graph the water and product levels versus time.

5. Observe the slope of the water/product interface line and determine the inflection point.

6. Measure the difference between the product line and the water/product interface line at the inflection point. This is the actual product thickness.

7. Determine the difference between the water/product interface level at the time of inflection and the stabilized top-of-product level. This is the sum of the actual product thickness and the capillary fringe.

8. Obtain the height of the capillary fringe by subtracting the measurement in Step 7 above from the measurement in Step 6.

On March 10, 2001, field bailout tests were conducted in wells D-MW2 and D-MW34. The results of the bailout tests and the determinations of product thickness for these wells are presented in Tables A-1 and A-2. The plots of water and product levels versus time are presented in Figures A-1 and A-2. Figure A-3 shows the contours of the actual formation product thickness in May 2001. The calculation of the volume of the actual formation product thickness is shown in Table A-3.

Additional field bailout tests were conducted in wells D-MW2, D-MW34, and D-MW35 on July 26, 2001. The results of the bailout tests and the determinations of product thickness for these wells are presented in Tables A-4, A-5, and A-6. The plots of water and product levels versus time are presented in Figures A-4, A-5, and A-6. Figure A-7 shows the contours of the actual formation product thickness in July 2001. The calculation of the volume of the actual formation product thickness is shown in Table A-7.

Table A-1. Bailout Results and Product Thickness Determination for Well D-MW2 (March 2001), Former Fuel Pit 1A/DAACG Area (Release #1), Hunter Army Airfield

Date and Time	Elapsed Time (minutes)	Product Level (feet BTOC)	Water Level (feet BTOC)
03/10/2001 13:28:00	Prior to pumping	11.45	12.8
03/10/2001 14:06:00	End of pumping	11.49	NR
03/10/2001 14:10:00	4	11.68	NR
03/10/2001 14:11:30	5.5	11.62	NR
03/10/2001 14:12:00	6	11.60	NR
03/10/2001 14:12:30	6.5	11.60	NR
03/10/2001 14:13:30	7.5	11.58	NR
03/10/2001 14:14:30	8.5	11.56	NR
03/10/2001 14:15:30	9.5	11.55	NR
03/10/2001 14:20:00	14	11.54	11.85
03/10/2001 14:25:00	19	11.52	11.86
03/10/2001 14:40:00	24	11.51	11.91
03/10/2001 14:55:00	29	11.49	11.95
03/10/2001 15:30:00	34	11.47	12.02
03/10/2001 16:00:00	64	11.46	12.06
03/10/2001 16:30:00	94	11.44	12.10
03/10/2001 17:30:00	154	11.43	12.18
03/10/2001 20:00:00	304	11.40	12.24
03/11/2001 07:53:00	675	11.29	12.54

Initial (static) readings: PL = 11.45; WL = 12.8 at 13:28.
Gallons removed: product = 3 gallons; water = 0.1 gallon.
BTOC Below top or casing.
DAACG Departure/Arrival Air Control Group.
NR Not recorded.

From Chart Plotting Water Level/Product Level Versus Time

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Point	11.70	11.55	0.15
Static	12.8	**11.45**	1.35
		11.21	±
		Actual Product Thickness Estimate (feet):	**0.15**
		Actual Product Thickness + Capillary Fringe (feet):	0.25
		Capillary Fringe Estimate (feet):	**0.10**

Note: Static product level measured before test was lower than the stabilized level after test. Using the after-test stabilized rate of approximately 11.2 (similar static product depth measurement in D-MW34), water level results comparable to those for D-MW34 were obtained.

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Point	11.70	11.55	0.15
Static	12.8	**11.2**	1.6
		Actual Product Thickness Estimate (feet):	**0.15**
		Actual Product Thickness + Capillary Fringe (feet):	0.50
		Capillary Fringe Estimate (feet):	**0.35**

BTOC Below top of casing.
DAACG Departure/Arrival Air control Group.

Table A-2. Bailout Results and Product Thickness Determination for Well D-MW34 (March 2001), Former Fuel Pit 1A/DAACG Area (Release #1), Hunter Army Airfield

Date and Time	Elapsed Time (minutes)	Product Level (feet BTOC)	Water Level (feet BTOC)
03/10/2001 13:25:00	Prior to pumping	11.21	12.71
03/10/2001 15:10:00	End of pumping	11.70	NR
03/10/2001 15:10:30	0.5	11.61	NR
03/10/2001 15:11:00	1	11.61	11.7
03/10/2001 15:11:30	1.5	11.61	11.7
03/10/2001 15:12:30	2.5	11.60	11.71
03/10/2001 15:13:30	3.5	11.59	11.72
03/10/2001 15:15:00	5	11.58	11.73
03/10/2001 15:20:00	10	11.58	11.73
03/10/2001 15:35:00	25	11.58	11.77
03/10/2001 15:50:00	40	11.57	11.79
03/10/2001 16:20:00	70	11.56	11.80
03/10/2001 16:50:00	100	11.56	11.81
03/10/2001 17:20:00	130	11.56	11.82
03/10/2001 20:00:00	290	11.55	11.84
03/10/2001 07:50:00	1000	11.53	11.91

Initial (static) readings: PL = 11.21; WL = 12.71 at 13:25.

Gallons removed: product = 5 gallons; water = 0.7 gallon.

BTOC Below top of casing.

DAACG Departure/Arrival Air Control Group.

NR Not recorded

From Chart Plotting Water Level/Product Level Versus Time

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Point	11.70	11.61	0.09
Static	12.71	**11.21**	1.5

Actual Product Thickness Estimate (feet): **0.09**

Actual Product Thickness + Capillary Fringe (feet): 0.49

Capillary Fringe Estimate (feet): **0.40**

Table A-3. Volume Determination of the April 2001 Product Plume at Former Fuel Pit 1A/ DAACG Area (Release #1), Hunter Army Airfield

Area of Product Thickness Contours

0.0-Foot Contour Area = A_1 = 120,754 ft^2

0.05-Foot Contour Area = A_2 = 48,994 ft^2

0.10-Foot Contour Area = A_3 = 10,589 ft^2

Volume of Product Between the 0.0-Foot Product Thickness Contour and the 0.05-Foot Product Thickness Contour

Average Product Thickness = T_1 = (0.0 ft + 0.05 ft) ÷ 2 = 0.025 ft

Volume = $V_1 = (A_1 - A_2) \times T_1$

= (120,754 ft^2 - 48,994 ft^2) × 0.025 ft = 1,794 ft^3

Volume of Product Between the 0.05-Foot Product Thickness Contour and the 0.1-Foot Product Thickness Contour

Average Product Thickness = T_2 = (0.05 ft + 0.1 ft) ÷ 2 = 0.075 ft

Volume = $V_2 = (A_2 - A_3) \times T_2$

= (48,994 ft^2 - 10,589 ft^2) × 0.075 ft = 2,880 ft^3

Volume of Product for the 0.10-Foot Product Thickness Contour and the Maximum Product Thickness

Product Thickness = T_3 = (0.10 ft + 0.15 ft) ÷ 2 = 0.125 ft

Volume = $V_3 = (A_3 - A_2) \times T_3$

= (10,589 ft^2) × 0.125 ft = 1,324 ft^3

Average Porosity for Site Soil During the CAP–Part B Investigation = 0.44 (CAP–Part B Report)

Total Volume of the Entire Product Plume

$V_T = (V_1 + V_2 + V_3) \times (\text{Porosity}) \times (7.48\ gal/ft^3)$

= (1,794 ft^3 + 2,880 ft^3 + 1,324 ft^3) × (0.44) × (7.48 gal/ft^3)

= 19,740 gallons

Amount of Recoverable Free Product Associated with the Entire Product Plume (assuming 25% recovery)

$V_R = (V_T) \times (0.25)$

= 19,740 gallons × (0.25)

= 4, 935 gallons

Total Volume of the Product Plume Within the 0.05-Foot Contour (i.e., located southwest of the flight barricades)

$V_T = (V_2 + V_3) \times (\text{Porosity}) \times (7.48\ gal/ft^3)$

= (2,880 ft^3 + 1,324 ft^3) × (0.44) × (7.48 gal/ft^3)

= 13,836 gallons

Amount of Recoverable Free Product Within the 0.05-Foot Contour (assuming 25% recovery)

$V_R = (V_T) \times (0.25)$

= 13,836 gallons × (0.25)

= 3,460 gallons

Table A-4. Bailout Results and Product Thickness Determination for Well D-MW2 (July 2001), Former Fuel Pit 1A/DAACG Area (Release #1), Hunter Army Airfield

Date and Time	Elapsed Time (minutes)	Product Level (feet BTOC)	Water Level (feet BTOC)
07/26/2001 19:13:00	Prior to pumping	11.47	12.78
07/26/2001 19:18:00	End pumping		
07/26/2001 19:19:00	1	11.9	11.95
07/26/2001 19:20:00	2	11.80	12.05
07/26/2001 19:21:00	3	11.78	12.08
07/26/2001 19:22:00	4	11.75	12.11
07/26/2001 19:23:00	5	11.74	12.11
07/26/2001 19:24:00	6	11.74	12.13
07/26/2001 19:25:00	7	11.72	12.14
07/26/2001 19:26:00	8	11.72	12.15
07/26/2001 19:27:00	9	11.72	12.16
07/26/2001 19:28:00	10	11.72	12.16
07/26/2001 19:29:00	11	11.71	12.17
07/26/2001 19:30:00	12	11.71	12.17
07/26/2001 19:32:00	14	11.71	12.19
07/26/2001 19:34:00	16	11.71	12.19
07/26/2001 19:36:00	18	11.71	12.19
07/26/2001 19:38:00	20	11.71	12.20
07/26/2001 19:40:00	22	11.71	12.21
07/26/2001 19:45:00	27	11.70	12.22
07/26/2001 19:50:00	32	11.70	12.23

Initial (static) readings: PL = 11.47; WL = 12.78 at 19:13.

Gallons removed: product = 0.9 gallon; water = 0.1 gallon.

BTOC Below top of casing.

DAACG Departure/Arrival Air Control Group.

From Chart Plotting Water Level/Product Level Versus Time

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Point	12.00	11.85	0.15
Static	12.78	**11.47**	1.31

Actual Product Thickness Estimate (feet):	**0.15**
Actual Product Thickness + Capillary Fringe (feet):	0.53
Capillary Fringe Estimate (feet):	**0.38**

Table A-5. Bailout Results and Product Thickness Determination for Well D-MW34 (July 2001), Former Fuel Pit 1A/DAACG Area (Release #1), Hunter Army Airfield

Date and Time	Elapsed Time (minutes)	Product Level (feet BTOC)	Water Level (feet BTOC)
07/26/2001 20:23:00	Prior to pumping	11.14	13.03
07/26/2001 20:27:00	End pumping		
07/26/2001 20:28:00	1	11.35	12.55
07/26/2001 20:29:00	2	11.33	12.56
07/26/2001 20:30:00	3	11.32	12.56
07/26/2001 20:31:00	4	11.32	12.56
07/26/2001 20:32:00	5	11.32	12.56
07/26/2001 20:33:00	6	11.31	12.57
07/26/2001 20:34:00	7	11.31	12.57
07/26/2001 20:36:00	9	11.31	12.58
07/26/2001 20:39:00	11	11.31	12.58

Initial (static) readings: PL = 11.12; WL = 13.03 at 20:23.
Gallons removed: product = 1.8 gallons; water = 0.2 gallon.

BTOC Below top of casing.

DAACG Departure/Arrival Air Control Group.

From Chart Plotting Water Level/Product Level Versus Time

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Points	11.82	11.50	0.32
Static	13.03	**11.14**	1.89

Actual Product Thickness Estimate (feet):	**0.32**
Actual Product Thickness + Capillary Fringe (feet):	0.68
Capillary Fringe Estimate (feet):	**0.36**

Table A-6. Bailout Results and Product Thickness Determination for Well D-MW35 (July 2001), Former Fuel Pit 1A/DAACG Area (Release #1), Hunter Army Airfield

Date and Time	Elapsed Time (minutes)	Product Level (feet BTOC)	Water Level (feet BTOC)
07/26/2001 19:57:00	Prior to pumping	11.2	12.69
07/26/2001 20:01:00	End pumping		
07/26/2001 20:02:00	1	11.68	11.82
07/26/2001 20:03:00	2	11.61	11.82
07/26/2001 20:04:00	3	11.60	11.85
07/26/2001 20:05:00	4	11.55	11.88
07/26/2001 20:06:00	5	11.54	11.91
07/26/2001 20:07:00	6	11.51	11.93
07/26/2001 20:08:00	7	11.51	11.94
07/26/2001 20:09:00	8	11.51	11.96
07/26/2001 20:10:00	9	11.51	11.97
07/26/2001 20:11:00	10	11.50	11.98
07/26/2001 20:12:00	11	11.50	11.98
07/26/2001 20:13:00	12	11.50	11.99
07/26/2001 20:15:00	14	11.49	12.00
07/26/2001 20:17:00	16	11.48	12.00

Initial (static) readings: PL = 11.2; WL = 12.69 at 19:57.

Gallons removed: product = 1.8 gallons; water = 0.2 gallon.

BTOC Below top of casing.

DAACG Departure/Arrival Air Control Group.

From Chart Plotting Water Level/Product Level Versus Time

	Depth to Water (feet BTOC)	Depth to Product (feet BTOC)	Product Thickness (feet)
Inflection Points	11.82	11.61	0.21
Static	12.69	**11.2**	1.49

Actual Product Thickness Estimate (feet): **0.21**

Actual Product Thickness + Capillary Fringe (feet): 0.62

Capillary Fringe Estimate (feet): **0.41**

Table A-7. Volume Determination of the July 2001 Product Plume at Former Fuel Pit 1A/ DAACG Area (Release #1), Hunter Army Airfield

Area of Product Thickness Contours

0.0-Foot Contour Area = A_1 = 147,513 ft^2
0.03-Foot Contour Area = A_2 = 61,191 ft^2
0.10-Foot Contour Area = A_3 = 22,265 ft^2
0.20-Foot Contour Area = A_4 = 7,076 ft^2

Volume of Product Between the 0.0-Foot Product Thickness Contour and the 0.03-Foot Product Thickness Contour

Average Product Thickness = T_1 = (0.0 ft + 0.03 ft) ÷ 2 = 0.015 ft
Volume = $V_1 = (A_1 - A_2) \times T_1$
= (147,513 ft^2 - 61,191 ft^2) × 0.015 ft = 1,295 ft^3

Volume of Product Between the 0.03-Foot Product Thickness Contour and the 0.10-Foot Product Thickness Contour

Average Product Thickness = T_2 = (0.03 ft + 0.10 ft) ÷ 2 = 0.065 ft
Volume = $V_2 = (A_2 - A_3) \times T_2$
= (61,191 ft^2 - 22,265 ft^2) × 0.065 ft = 2,530 ft^3

Volume of Product Between the 0.10-Foot Product Thickness Contour and the 0.20-Foot Product Thickness Contour

Average Product Thickness = T_3 = (0.10 ft + 0.20 ft) ÷ 2 = 0.15 ft
Volume = $V_3 = (A_3 - A_4) \times T_3$
= (22,265 ft^2 - 7,076 ft^2) × 0.15 ft = 2,278 ft^3

Volume of Product for the 0.20-Foot Product Thickness Contour and the Maximum Product Thickness

Product Thickness = T_4 = (0.20 ft + 0.32 ft) ÷ 2 = 0.26 ft
Volume = $V_4 = (A_4 - A_3) \times T_4$
= (7,076 ft^2) × 0.26 ft = 1,840 ft^3

Average Porosity for Site Soil During the CAP–Part B Investigation = 0.44 (CAP–Part B Report)
Total Volume of the Entire Product Plume

$V_T = (V_1 + V_2 + V_3 + V_4) \times$ (Porosity) × (7.48 gal/ft^3)
= (1,295 ft^3 + 2,530 ft^3 + 2,278 ft^3 + 1,840 ft^3) × (0.44) × (7.48 gal/ft^3)
= 26,142 gallons

Amount of Recoverable Free Product Associated with the Entire Product Plume (assuming 25% recovery)

$V_R = (V_T) \times (0.25)$
= 26,142 gallons × (0.25)
= 6,535 gallons

Total Volume of the Product Plume Within the 0.03-Foot Contour (i.e., located southwest of the flight barricades)

$V_T = (V_2 + V_3 + V_4) \times$ (Porosity) × (7.48 gal/ft^3)
= (2,530 ft^3 + 2,278 ft^3 + 1,840 ft^3) × (0.44) × (7.48 gal/ft^3)
= 21,880 gallons

Amount of Recoverable Free Product Within the 0.03-Foot contour (assuming 25% recovery)

$V_R = (V_T) \times (0.25)$
= 26,142 gallons × (0.25)
= 5,470 gallons

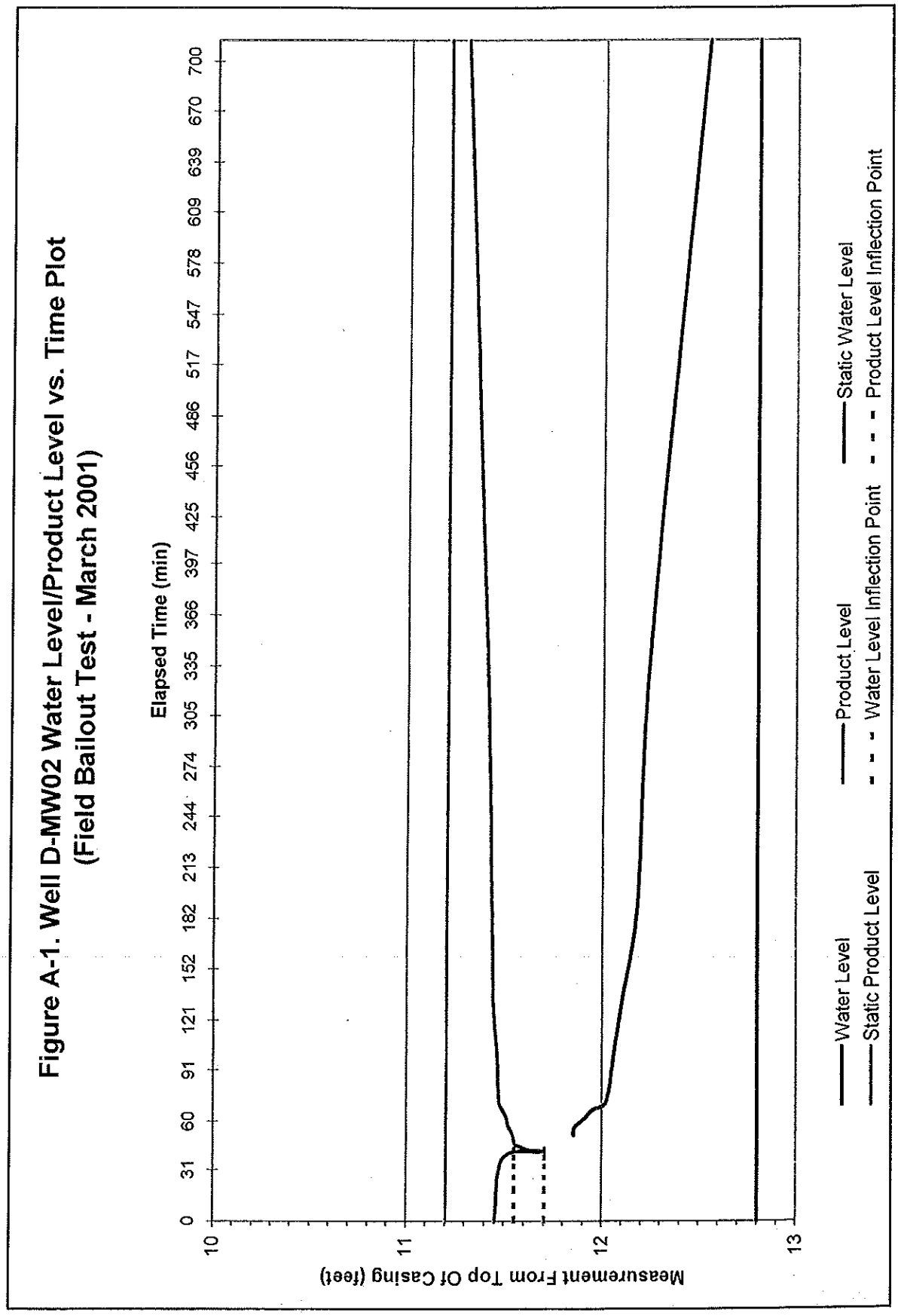
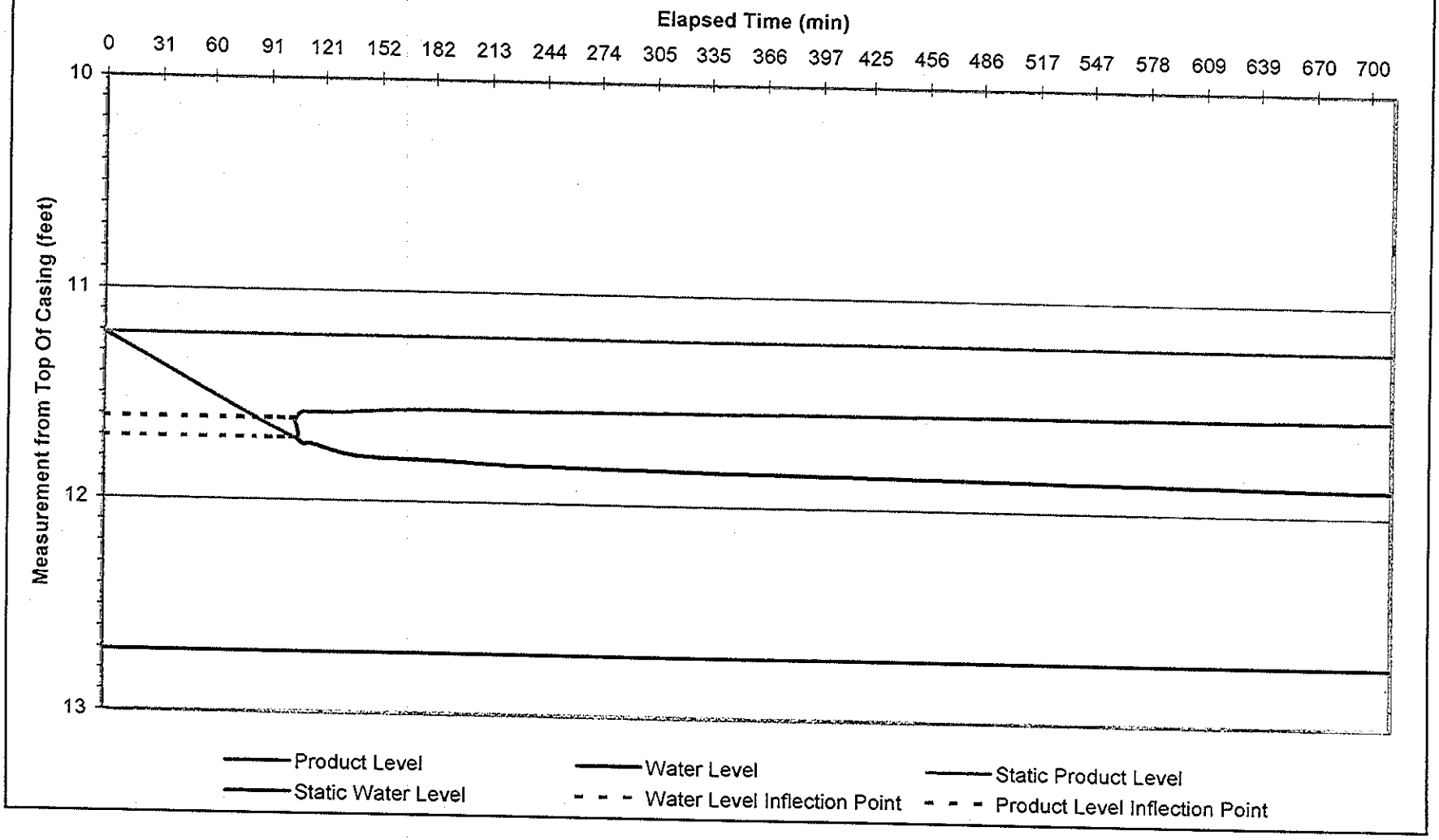


Figure A-1. Well D-MW02 Water Level/Product Level vs. Time Plot
(Field Bailout Test - March 2001)
Elapsed Time (min)
0
31
60
91
121
152
182
213
244
274
305
335
366
397
425
456
486
517
547
578
609
639
670
700
Measurement From Top Of Casing (feet)
10
11
12
13
Water Level
Static Product Level
Product Level
Water Level Inflection Point
Static Water Level
Product Level Inflection Point

Figure A-2. Well D-MW-34 Water Level/Product Level vs. Time Plot (Field Bailout Test - March 2001)



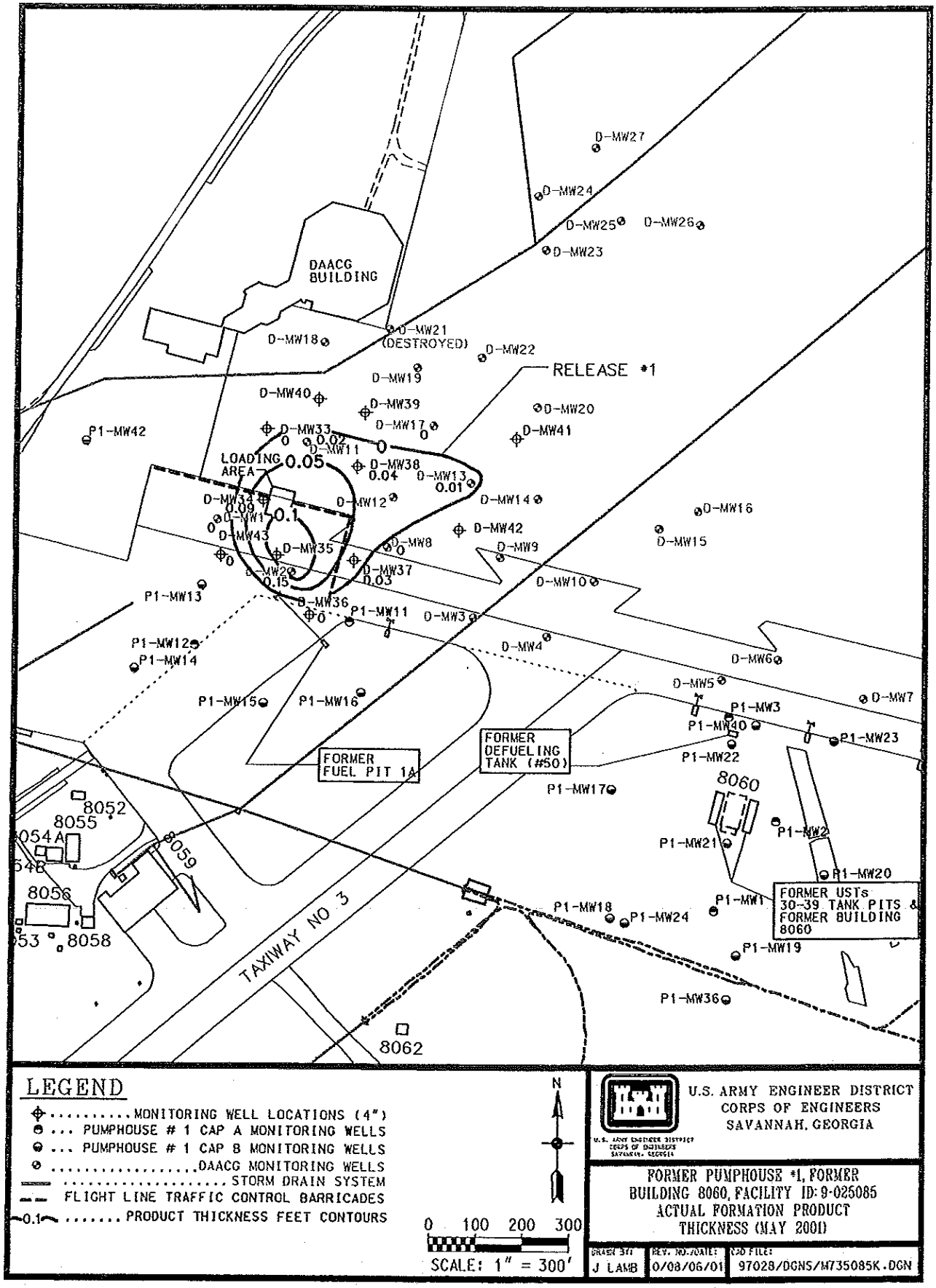


Figure A-3. Actual Product Thickness (May 2001)

Figure A-4. Well D-MW02 Water Level/Product Level vs. Time Plot (Field Bailout Test -July 2001)

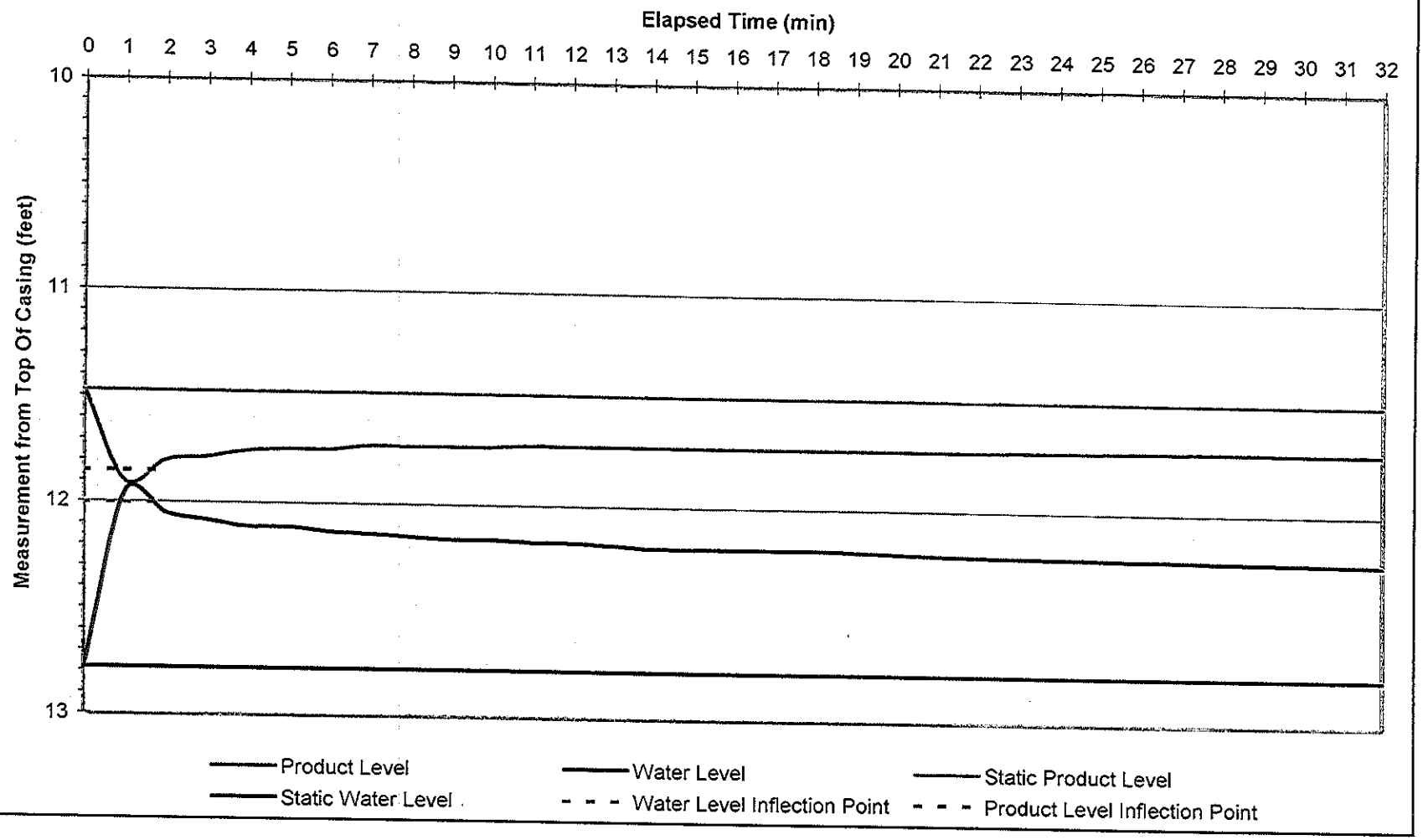


Figure A-5. Well D-MW35 Water Level/Product Level vs. Time Plot (Field Bailout Test - July 2001)

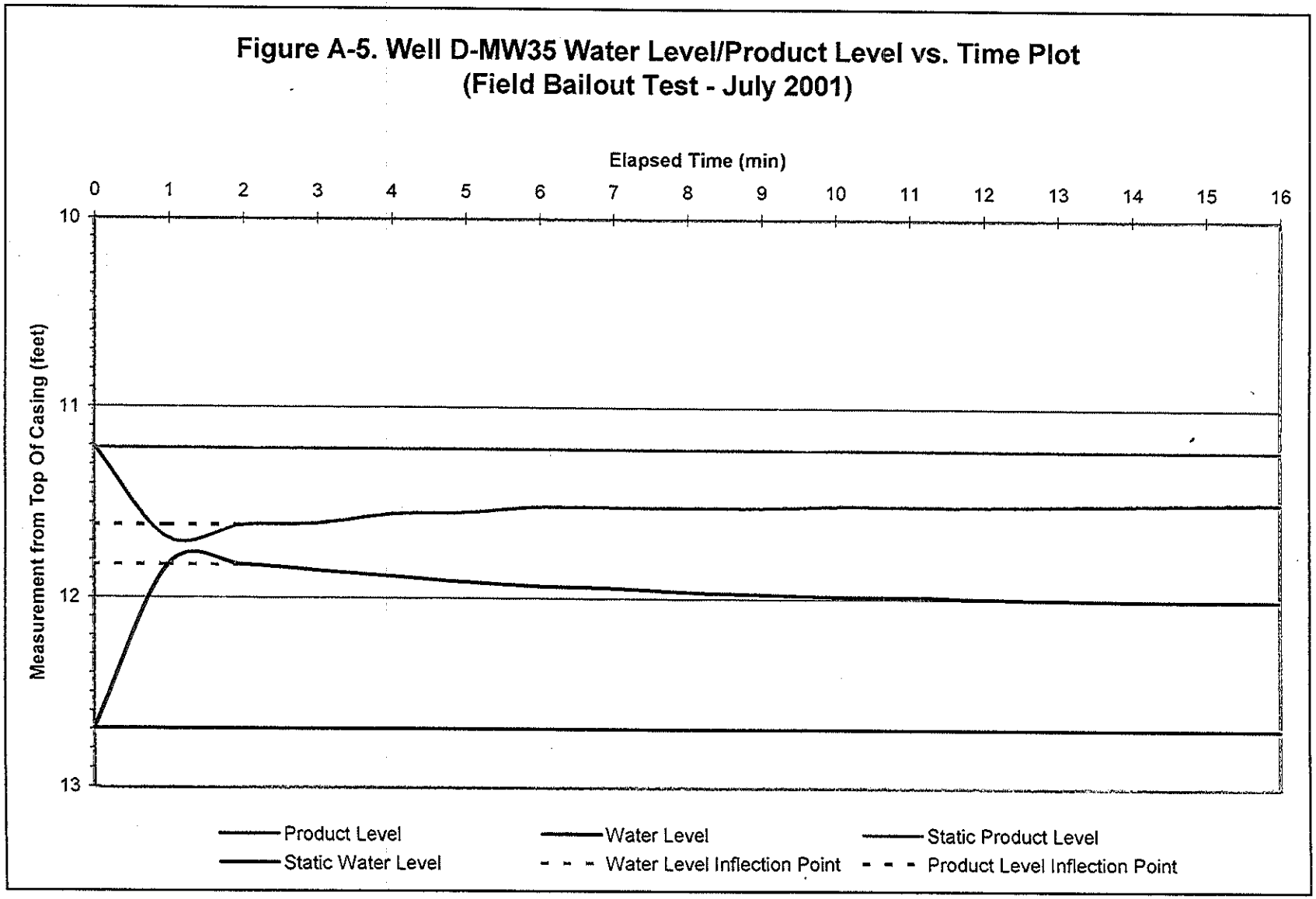
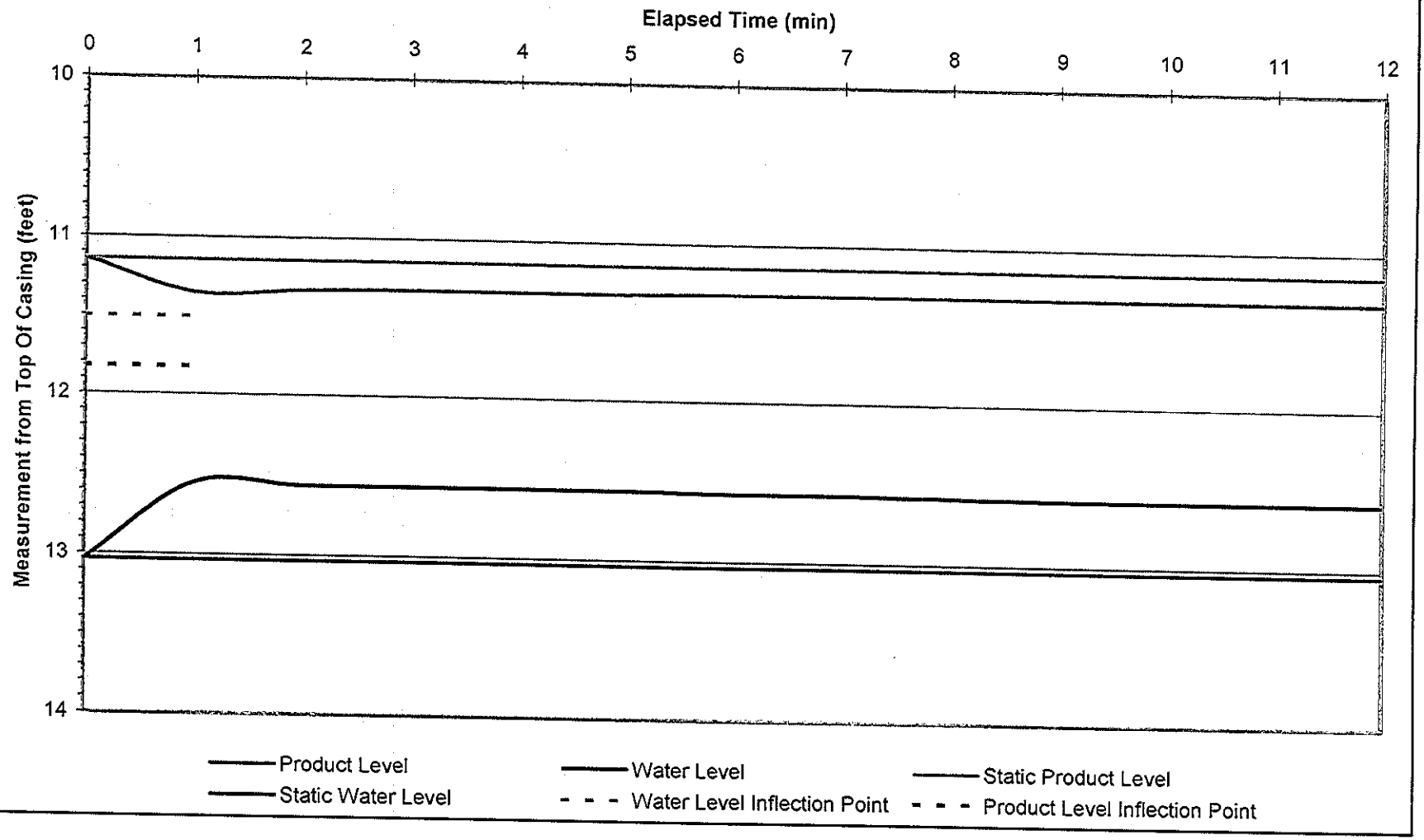


Figure A-6. Well D-MW34 Water Level/Product Level vs. Time Plot (July 2001)



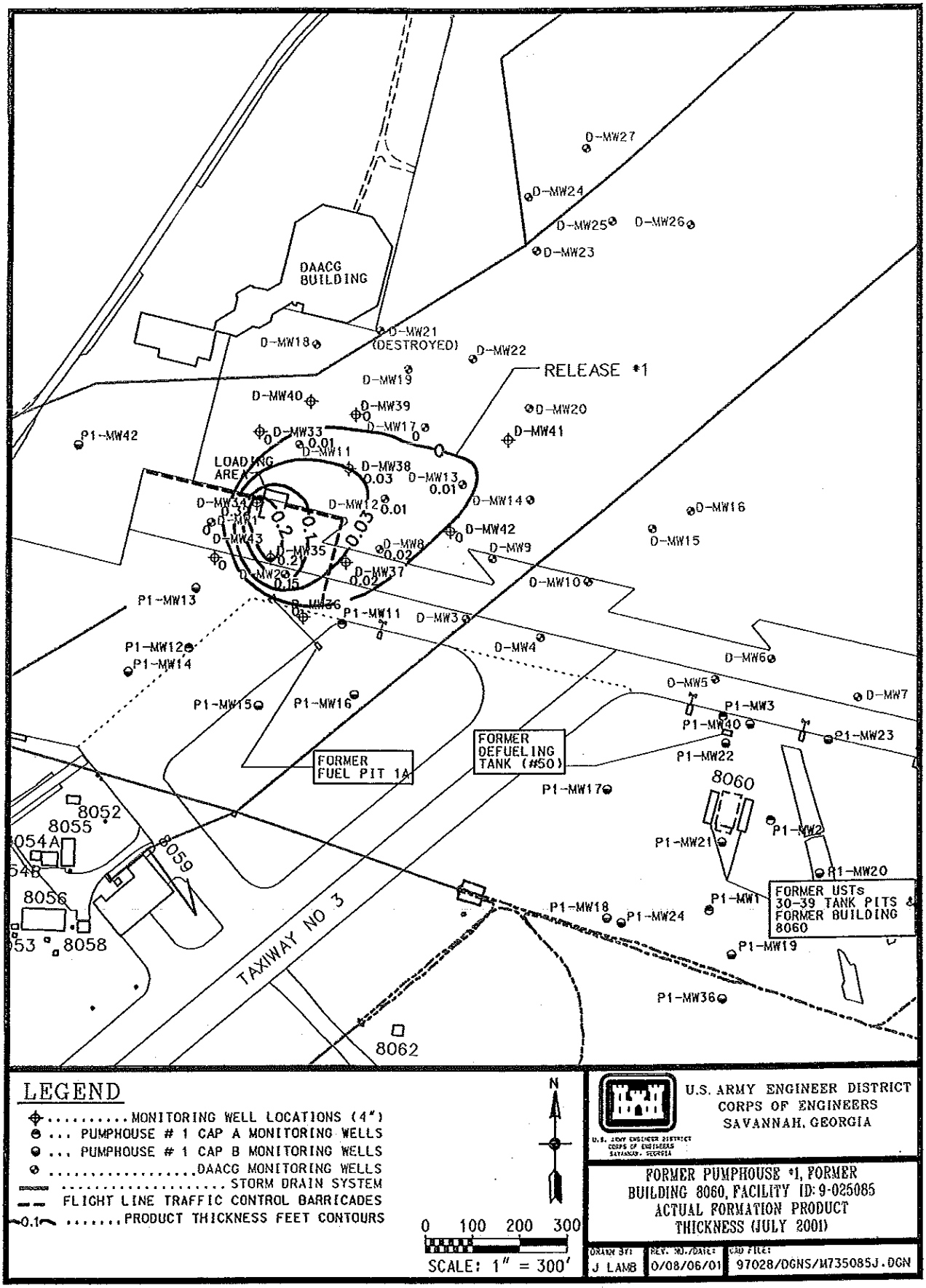


Figure A-7. Actual Product Thickness (July 2001)

ATTACHMENT B

GEOTECHNICAL RESULTS

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TABLE 1
SUMMARY OF LABORATORY TESTING RESULTS

SAIC – DAACG

CATLIN PROJECT NO. 201-024

	LABORATORY ANALYSIS				
SAMPLE ID	MOISTURE CONTENT (%)	ATTERBERG LIMITS (LL/PL)	SPECIFIC GRAVITY	AVERAGE HYDRAULIC CONDUCTIVITY (cm/sec^2)	POROSITY
AK 3931	NA	NA*	NA	NA	NA
AK 3731	27	74/28	2.38	9.86E-09	0.38

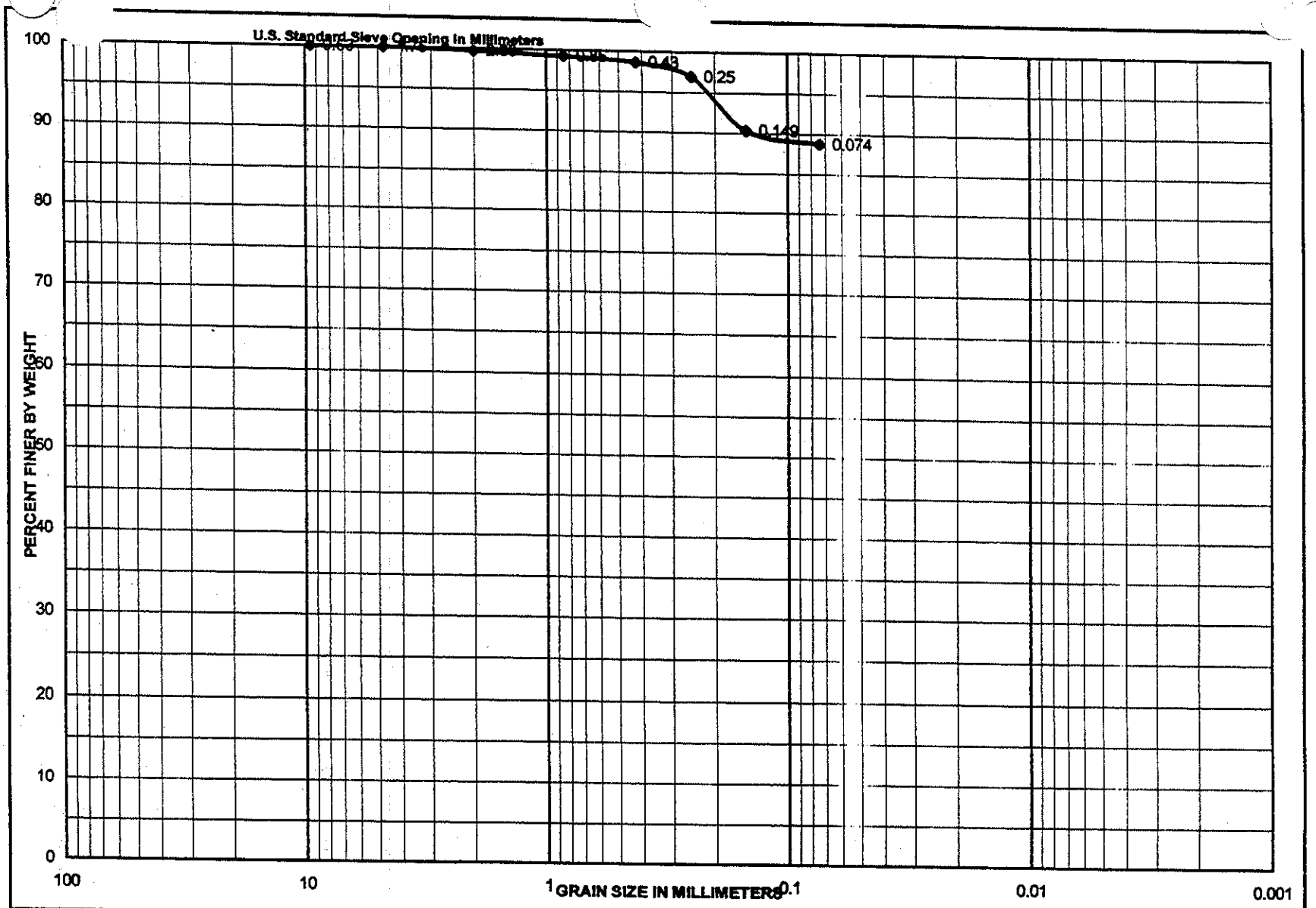
NA = Not Analyzed
LL = Liquid Limit
PL = Plastic Limit
* = There was not enough sample to conduct test

TABLE 2
SUMMARY OF LABORATORY TESTING RESULTS

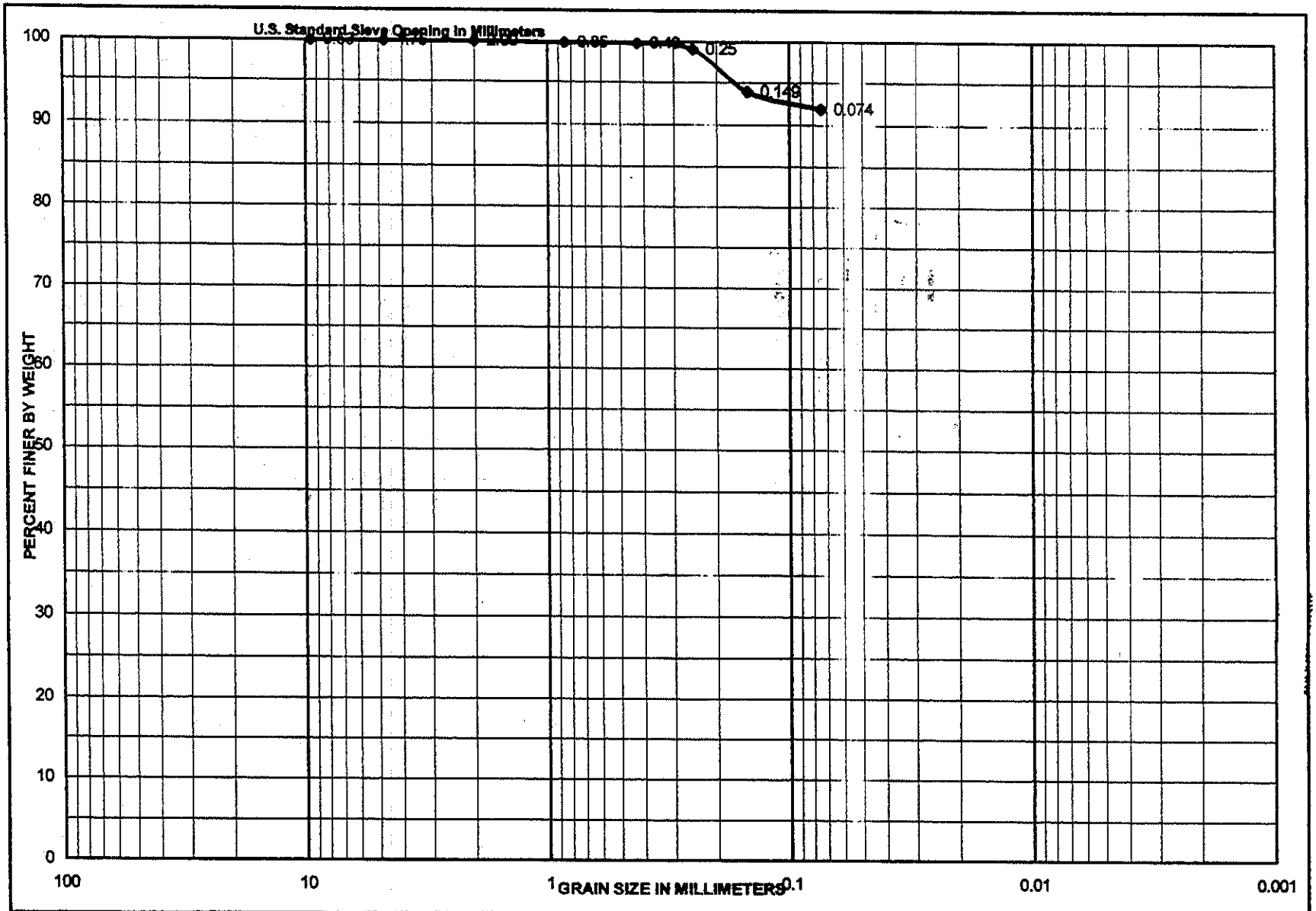
SAIC – DAACG

CATLIN PROJECT NO. 201-024

GRAIN SIZE		
SIEVE	AK 3731 % PASSING	AK 3931 % PASSING
3/8"	100.0	100.0
No. 4	100.0	100.0
No. 10	99.7	100.0
No. 20	99.2	99.9
No. 40	98.6	99.8
No. 60	96.9	99.1
No. 100	90.3	93.9
No. 200	88.8	91.9



Sample No.	Depth (ft)	Classification	
AK3731			**Project** SAIC
			Area DAACG
			CATLIN Geotechnical Laboratory
			Boring No.
			Date 2/22/2001



Sample No.	Depth (ft)	Classification	
AK3931			**Project** SAIC
			Area DAACG
			CATLIN Geotechnical Laboratory
			Boring No.
			Date 2/22/2001

SUMMARY OF HYDRAULIC CONDUCTIVITY TEST RESULTS

(ASTM D 5084)

Project Name:	SAIC
Job Number:	201-024
Sample Quality:	Good
Sample Type:	Clayey with odd shaped dia.
Sample Number:	AK3731

SAMPLE DATA		
	INITIAL	FINAL
Moisture (%)	18.95	38.97
Length (cm)	9.68	9.47
Diameter (cm)	7.11	7.11
Dry Density (pcf)	91.96	81.44
Percent Saturation	73.32	112.62

PRESSURE DATA - DE-AIRED WATER	
Average Confining Pressure (psi)	10
Average Head Pressure (psi)	3
Average Hydruaiic Gradient	21.8

AVERAGE HYDRAULIC CONDUCTIVITY (k_{20}) 9.86E-09

SAIC An Employee-Owned Company
Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: CDAG01

PROJECT NAME: ~~HAAP UST# 358.26~~ DAACG

PROJECT NUMBER: 01-1624-04-2725-220

PROJECT MANAGER: Patty Stoll

Sampler (Signature) Laura Lumley (Printed Name) Laura Lumley

Sample ID	Date Collected	Time Collected	Matrix	MOISTURE CONTENT	GRAIN SIZE (SIEVE)	ATTERBERG LIMITS	PERMEABILITY	SPECIFIC GRAVITY	POROSITY/BULK DENSITY	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
AK3931	2/2/01	1500	Soil		X	X				1		
AK3731	2/6/01	1200	Soil	X	X	X	X	X	X	1		

REQUESTED PARAMETERS

LABORATORY NAME: Catlin Laboratories

LABORATORY ADDRESS: 1051 Johnnie Dodds Blvd. Suite C Mt. Pleasant, SC 29464

PHONE NO: (803) 881-6000

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
Laura Lumley	2/9/01 1200		
COMPANY NAME: SAIC		COMPANY NAME:	
RECEIVED BY: 824184133591	Date/Time 2/9/01 1200	RELINQUISHED BY:	Date/Time
COMPANY NAME: FedEx		COMPANY NAME:	
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time
COMPANY NAME:		COMPANY NAME:	

TOTAL NUMBER OF CONTAINERS: 2

Cooler ID: N/A

Cooler Temperature:

FEDEX NUMBER: 824184133591

B-8

Georgia Departme... of Natural Resources
Environmental Protection Division
Underground Storage Tank Management Program
4244 International Parkway, Suite 104, Atlanta, Georgia 30354
Lonice Barrett, Commissioner
Harold F. Reheis, Director
(404)362-2687

November 20, 2001

Colonel Gregory V. Stanley
Director, Public Works
U.S. Army/HQ3d Inf. Div. (Mech.)
1550 Frank Cochran Drive
Ft. Stewart, GA 31314-4927

SUBJECT: **Corrective Action Plan (CAP) -Part B Addendum #1 Review Comments:**
Hunter AAF, Former Fuel Pit #1 and Former Pumphouse #1
Former Building 8060
Savannah, Chatham County, GA
Facility ID: 9025085*1 and *2

Dear Colonel Stanley:

The Georgia Underground Storage Tank Management Program (USTMP) has received your letter, dated October 9, 2001, that forwarded a properly certified CAP-Part B. The report was prepared by SAIC.

We have conducted a technical review of the CAP-Part B. The basis for this review is the Georgia Rules for Underground Storage Tank Management (GUST Rules, revised 1996). Our comments are outlined in the enclosure. Please amend the CAP-Part B to address these by **December 31, 2001.**

Unless one of the outlined EPD Comments requests otherwise, you are required to submit only your responses to these comments. Resubmittal of a complete CAP-Part B is not necessary.

If you have any questions, please contact me at (404) 362-2687.

Sincerely,

William E. Logan
Senior Geologist
Corrective Action Unit II

WEL:
s:/land/landdocs/williaml/pending01/9025085.15
Enclosure
cc with EPD comments: Patricia Stroll, SAIC
Lisa L. Lewis, GA EPD
Larry Rogers, EPD Coastal District
File (CA): Chatham, 9025085

EPD Review Comments

Corrective Action Plan (CAP)-Part B Addendum #1:
Hunter AAF, Former Fuel Pit #1 and Former Pumphouse #2
Former Building 8060
Savannah, Chatham County, GA
Facility ID: 9025085*1 and *2

November 20, 2001

01. Laboratory reports and chain of custody documentation are not originals. Please provide original laboratory report and chain of custody documentation for soil and groundwater samples analyzed.
02. The quantitation limit and analytical method used for sample analysis were not provided. Please provide the quantitation limit and analytical method used for all constituents and for all samples analyzed.
03. Please provide copy of the plan for public viewing at the local library, courthouse, city hall or other public facility. Please provide date and location of placement of the plan for public viewing.
04. The corrective action objectives state that free product will be recovered until free product recovery had reached a "diminishing return". This statement is very vague. The EPD CAP-Part B guidelines state free product recovery should continue until free product is less than 1/8" thickness. Please amend the CAP-B to provide a more defined objective.

DEPARTMENT OF THE ARMY
HEADQUARTERS, 3D INFANTRY DIVISION (MECHANIZED) AND FORT STEWART
DIRECTORATE OF PUBLIC WORKS
1550 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4927

REPLY TO
ATTENTION OF

DEC 20 2001

Office of the Directorate

CERTIFIED MAIL

Georgia Department of Natural Resources
Underground Storage Tank Management Program
Attention: Mr. William Logan
4244 International Parkway, Suite 104
Atlanta, Georgia 30354

Dear Mr. Logan:

Fort Stewart is pleased to receive the Georgia Environmental Protection Division's (GA EPD's) correspondence dated November 20, 2001 regarding the Corrective Action Plan (CAP)-Part B Addendum #1, former Building 8060, Facility Identification Number 9-025085*1 and *2, Hunter Army Airfield, Georgia.

Fort Stewart looks forward to discussing the comments in detail during the second week in January 2002, as tentatively arranged during a December 19, 2001 telephone conversation between yourself and Mr. Paul Kerl, of this directorate. However, in preparation for this conference call and in order to provide response to your comments by year end as requested in the referenced correspondence, Fort Stewart has prepared a Response to Comments Table for your use.

If it would be more convenient, Fort Stewart would be glad to arrange to meet with you in Atlanta during the month of January. Fort Stewart appreciates your assistance in clarifying and resolving these few outstanding issues. If you have any questions or comments, please contact Ms. Tressa Rutland, Directorate of Public Works, Environmental Branch, at (912) 767-2010.

Sincerely,

for Thomas C. Fry
Gregory V. Stanley
Colonel, U.S. Army
Director, Public Works

Enclosure